

The Only Journal With a Paid Circulation in the Rock Products Industry

# Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879

CLINTON S. DARLING, Editor  
CHARLES A. BRESKIN, Adv. Mgr.  
E. M. GIBSON, Asst. Mgr.  
JOSEPH K. COSTELLO, Central Rep.

N. C. ROCKWOOD, Advisory Editor  
H. E. HOPKINS, Associate Editor  
ALLAN B. SANGER, Eastern Rep.  
GEO. P. MILLER, Manager

**SUBSCRIPTION**—Two dollars a year to United States and Possessions. Three dollars a year to Canada and foreign countries. Twenty-five cents for single copies.

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W. D. CALLENDER, President  
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MEMBER A. B. P.

GEO. P. MILLER, Treasurer  
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Volume 25

August 12, 1922

Number 16

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## "Can't Do Without It"

A trade journal's reason for existence lies in the esteem in which it is held by its readers. Unless it is rendering a hearty, intelligent, unselfish service to every one of its readers it does not deserve to exist, nor will it gain the respect, admiration, and confidence of those it is trying to serve.

Expressions of confidence and approval of Rock PRODUCTS and the work it is doing are frequent in this country. But its reputation is not confined to this Western Hemisphere. Many subscribers in foreign lands look to ROCK PRODUCTS for the information that is to keep them abreast of the times in these rock products industries, and occasionally a letter of appreciation comes wholly unexpectedly from across the ocean as did the one below.

John H. Bentley, A. M. I. Mech. E., of Misterton, via Doncaster, England, writing for reprints of some Rock PRODUCTS articles, says:

"It is with much interest that I look forward to the arrival of your very interesting and instructive paper. The remark of one of your subscribers, 'would not be without ROCK PRODUCTS,' is putting it in too mild a form. I frankly say, 'could not possibly do without it.'"

Similar statements from American producers are common. "You have a wonderful paper and nothing comes to my desk that I enjoy more," says Herbert R. Gill, president of the Columbus Consumers Supply Co.

Statements like these mean only one thing—that ROCK PRODUCTS is fulfilling its mission and that the efforts of those who produce it are appreciated.

## Keeping Up With the Times

Present conditions recall the serious times of 1920. Coal supplies are low, cars are becoming scarce, and each producer individually is wondering what he is going to do about it. He realizes his own situation, but he isn't fully aware of conditions in other parts of the country, and without that knowledge he cannot act to take fullest advantage of the situation.

It is to supply this knowledge of general conditions that ROCK PRODUCTS has been in touch with representative producers during the past week, and the results of these efforts give a picture of conditions which every producer will find illuminating and helpful. The second article of this issue is one that no reader should miss.

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are getting  
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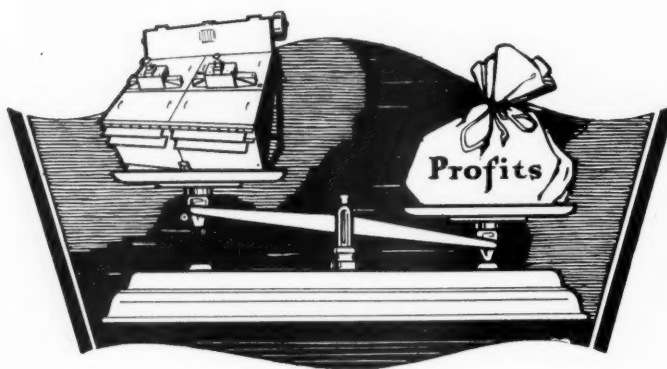
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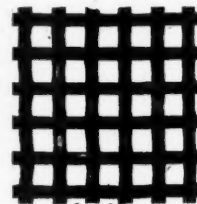
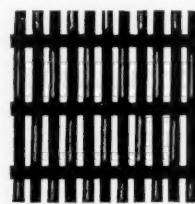
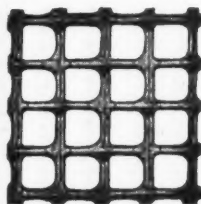
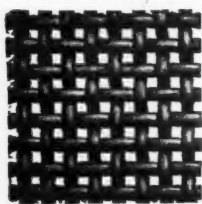


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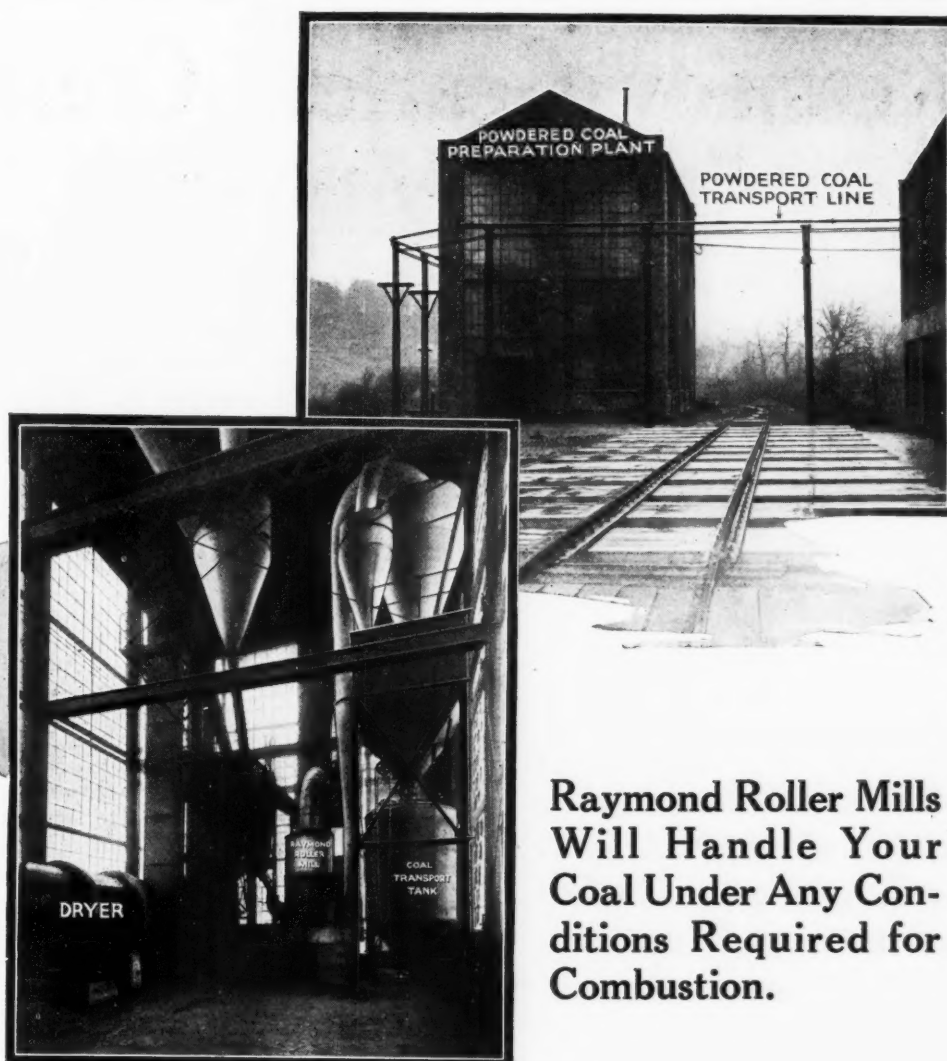
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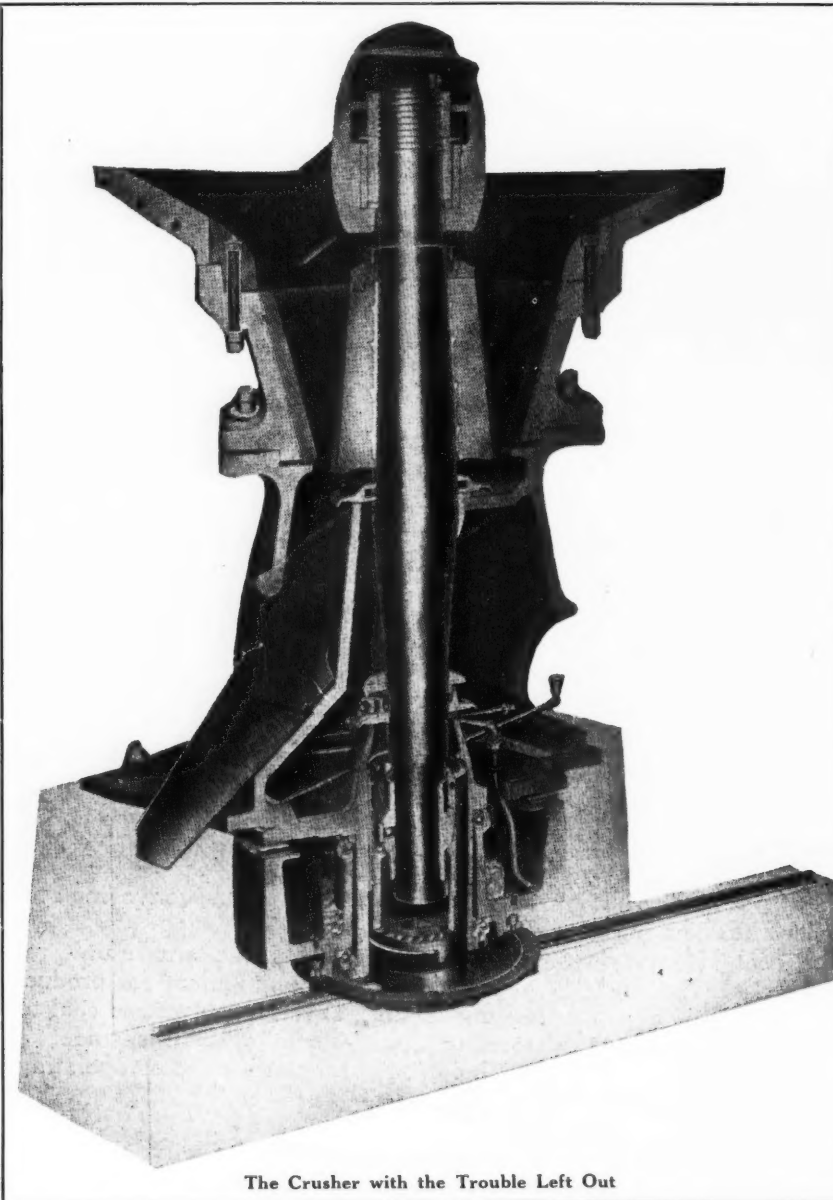
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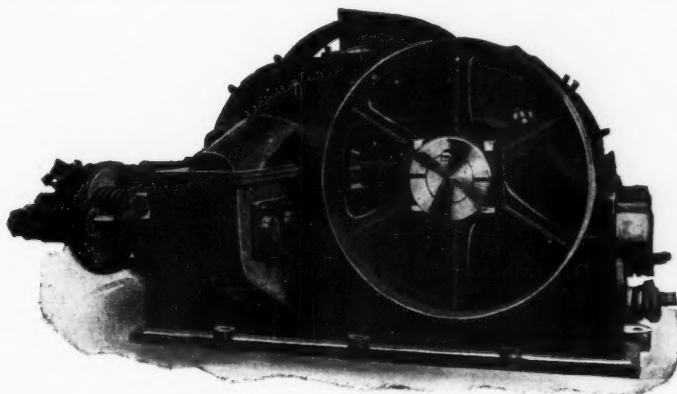
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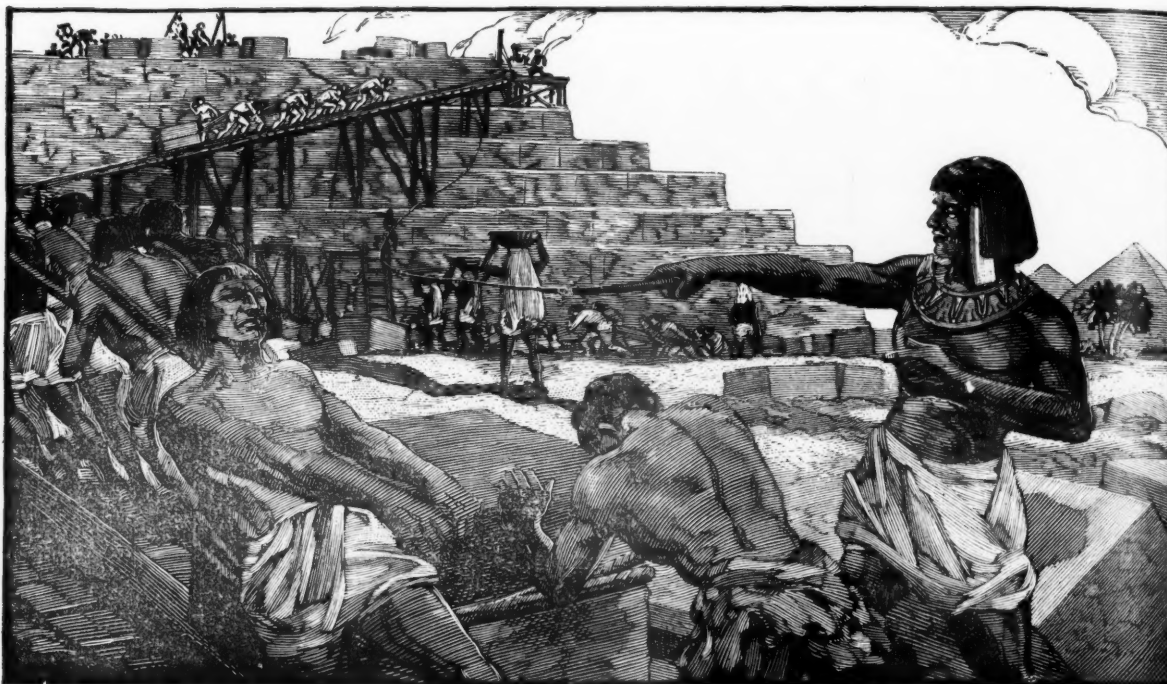
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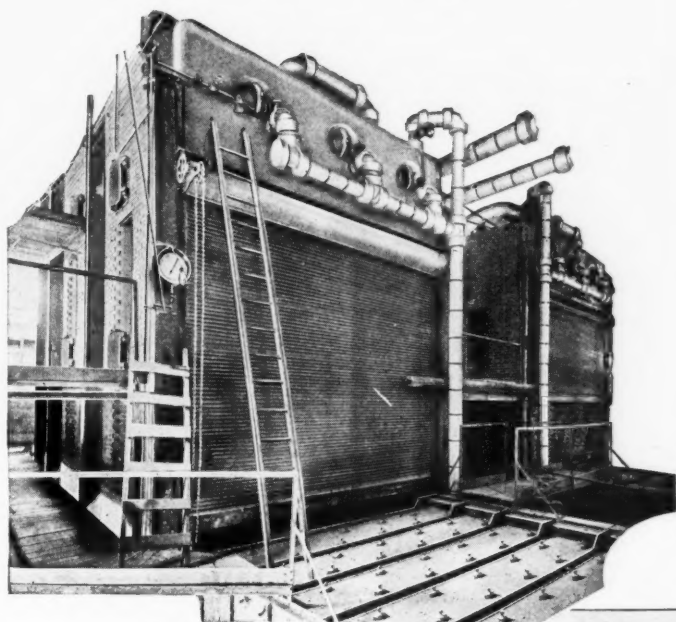
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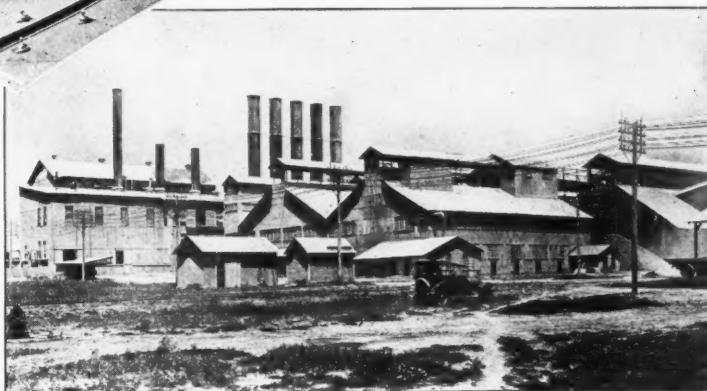
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Two 1089 H. P. Edge Moor Waste Boilers, Trinity Portland Cement Co., Eagle Ford Tex. Special Green Economizers in foreground.



Trinity Plant from south. Kiln building and power house in foreground.

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Note how the digger edge buckets dig themselves into a pile of material and take a full load without the aid of shovels or mechanical devices



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**The Jeffrey Portable Belt Conveyor** meets the demands for a light, durable and inexpensive conveyor for loading and unloading Sand, Gravel, Crushed Stone, Coal, Coke, Cinders, etc. Capacity from 20 to 50 tons per hour.

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The Jeffrey Radial Loader is fully illustrated and described in Catalog No. 309-H

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Like a Traction Wheel Shovel**

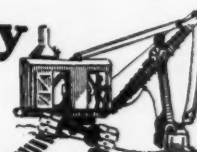
The trucks can be on different levels and inclined at different angles, yet the shovel body is in perfect working position. This new truck—the Marion "Quad"—is the one truck combining power and easy steering with maximum flexibility

257



**The Marion Steam Shovel Company**  
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Marion Crawler Trucks Make Hard Going Easy



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# PLYMOUTH

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### Does the Work of 12 Mules and 6 Drivers

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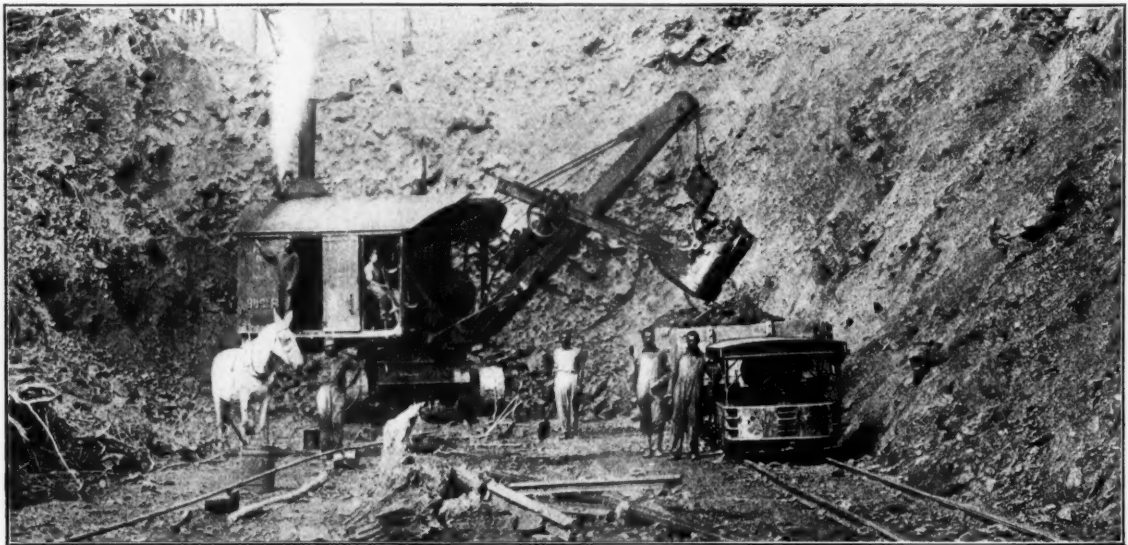
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**THE FATE-ROOT-HEATH CO. :: Plymouth, Ohio**



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Volume XXV

Chicago, August 12, 1922

Number 16

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Large storage piles of one grade or another, with the expensive handling and rehandling involved, are what eat up the profits of many sand and gravel producers. Here is a pit where deposits of varying composition have been spotted so that only the material for which there is actual demand need be excavated

SAND producers in New York State and other places frequently have to consider gravel as a waste product because there is no market for it. State highway officials do not sanction its use in road building, and huge piles of gravel for which there is no market are frequently seen at sand and gravel plants in these sections. On the other hand gravel is the product for which there is a demand in some of the central states, and sand is often given away in order to get it off the property.

In spite of the general condition in New York state there are occasional demands made for gravel, and there is one

plant where this situation of a constant demand for sand and an intermittent demand for gravel is being met without too much expensive handling of gravel during the periods when there are no orders for it. This plant is the one at Attica, operated by the J. E. Carroll Sand Co., of Buffalo. Here by means of selective quarrying from different parts of the deposit the company is enabled to produce practically all sand or practically all gravel, as the current orders may require.

This is made possible, of course, by the nature of the deposit, which is in the form of a hill 90 ft. high, one side of which contains very fine sand and the

other side gravel and coarse sand. There are places where the sand runs as high as 90 per cent or more of the material, while in other places 75 per cent or better of the material is gravel. Two locomotive cranes are used in the excavation work and these can be easily transferred in a few minutes from one part of the deposit to another so that no time is lost when the demand changes from sand to gravel or vice versa. It is upon the nature of the deposit and the mobility of these locomotive cranes that the company depends to meet the varying market conditions of demand promptly and economically.



*At the right is the fine sand deposit which furnishes material to be excavated when there are no gravel orders on the books. At the left and beyond are the deposits running high in gravel*



**When gravel is in greater demand the readily moved locomotive cranes are shifted to these deposits. This selective quarrying produces the materials as demanded, and avoids much of the expensive rehandling common to gravel plants**

The plant which handles the material was formerly a dry screening plant, but it has been rebuilt into a washing plant of from 30 to 35 cars a day capacity. This is about five times the capacity of the old plant, the remodeling of which took place only three years ago. To effect this increase, the main belt was changed from a 24-in. to a 30-in., two revolving washing screens were added to replace the old screening apparatus, a second locomotive crane was added to the first and then, in the spring of 1920, the plant was electrified. Since that time a number of minor improvements have been made here and there as errors in the design became apparent until at present the plant is a very effective one and has a number of clever devices which may aid in accomplishing the work with few interruptions for breakdowns. Two 6-yd. and two 4-yd. hopper bottom cars, one 7-ton Amer-

ican and one 7-ton Plymouth gasoline locomotives are used in hauling the sand and gravel from the locomotive cranes to the feeding hopper over the lower end of the main belt.

One of the illustrations shows this hop-

per with a man in it cleaning it out for the night so that rain will not clog the hopper. A feed chain running down the bottom of the hopper serves to keep the sand and gravel moving through the automatic feed to the belt. This same illus-



**Two seven-ton locomotives haul material from all parts of the pit to this hopper feeding the belt shown at the right**



**The lower belt conveyor carries the crushed gravel back to the main belt. A hopper feeds gravel dumped into it from storage by a locomotive crane to this secondary belt for conveying back to the bins**



**Where the secondary belt discharges to the main belt. The two white arrows point to weighted pulleys which slide freely on vertical guides to keep the two belts at proper tension**



*In the crusher at the right oversize gravel is crushed and from there conveyed on the secondary belt and discharged as shown at the left to the main belt to be returned to the screens*

tration shows two of the cars just coming through one of the two houses which are used to shelter the locomotives when not in use.

At the top of the screening plant the belt dumps into two parallel Allis-Chalmers revolving screens each 12 ft. long and 4 ft. in diameter, with a jacket 8 ft. long and 6 ft. in diameter. The screen has  $\frac{5}{8}$ -in. and 2-in. perforations, and the jacket has  $\frac{3}{4}$ -in. perforations. A 40-hp. motor drives the two cranes and the main belt. The oversize from the screens is chuted into a No. 4 Gates crusher located on the ground just outside the screening plant and from the crusher the material is conveyed up a belt and dumped on the main belt about midway of the main belt and carried back to the screens.

A gravel storage pile is provided on the opposite side of the track from the main belt, and a locomotive crane can load from this storage pile into cars direct or into a hopper over the secondary belt and thus carry material in storage back to the screens and into the bins when there is a shortage of this material.

The concrete gravel from the screens gets a special rinsing in passing through a chute in the bottom of which are  $\frac{1}{4}$ x1-in. slots and over which is a  $\frac{1}{4}$ -in. pipe with 20  $\frac{1}{8}$ -in. holes spraying water over the gravel as it passes through the chute. The initial washing takes place inside the screens in each of which a 3-in. pipe discharges water pumped by two 6-in. Allis-Chalmers centrifugal pumps at the rate of 700 gal. per min.

Sand and the wash water are diverted into settling tanks and the concrete and brick sand removed by an endless chain separator, while the overflow from these settling tanks passes into an Allen Cone, which removes the fine asphalt sand, all of which will pass through a 50-mesh screen.

Five bins below the screening and washing plant will hold a total of nine carloads of product. These bins are for

each of the five products, concrete gravel, roofing gravel, concrete sand, brick sand, and asphalt sand. It is this last product for which there is a considerable demand and the side of the deposit which contains a large percentage of fine sand meets this demand very well.

The bottom of the asphalt sand tank is sloping and metal lined, and a pipe running up the center of this slope near the bottom with holes drilled along each side sprays water into the fine sand and causes it to flow through the loading door into the cars below.

Nine men, including the locomotive crane operators, operate the plant at a normal output of 1500 tons of product a day. Shipments are made almost wholly by rail. Two storage tracks will accommodate about 35 cars and these can be operated by gravity from the storage tracks to the loading track below the plant and into the main storage switch, where the cars await shipment.

The J. E. Carroll Sand Co. is the oldest sand and gravel producing company in Western New York. They began operation in 1897. It is the intention of this company to begin the erection of a new washing plant located south of Buffalo in New York State near the boundary line between New York and Pennsylvania. The initial output of this new plant will be about 35 cars of sand and gravel per day. The plant will be built so that it can be easily increased to 50 or 60 cars. They expect to have this plant in operation by April 1, 1923.

### Map of Producing Coal Districts

IN its list of recent publications, the Geological Survey offers a wall map, 48x75 in., scale 1 in. to 40 miles, which shows by a red overprint the outline of the areas in which coal is being produced. It also names the districts under which these areas are grouped. The price of this map is 75 cents; if included in wholesale orders, 45 cents.

### Ontario's Soapstone Deposits

WHAT promises to be an important and valuable source of soapstone has lately been investigated by H. S. Spence, of the Mines Branch, Canadian Department of Mines. The deposit occurs one mile west of Wabigoon, on the Canadian Pacific Railway, near Dryden, Ont., and is but 500 yd. from the railway. There is very little overburden and the outcrops indicate a large body of soapstone.

The stone may be termed soapstone, though, beyond being soft enough to cut readily with an ordinary saw, it bears little resemblance to what is usually classed as soapstone. It is a dark, greenish-gray rock, composed largely of talc, and is very similar in appearance and in composition to the so-called "alberene stone" of Virginia, which is extensively used for switchboard panels, laboratory equipment and laundry tubs, and for lining furnaces, etc.

The Wabigoon deposit is the most promising, from an economic standpoint, of any of the soapstone occurrences as yet found in Canada; there appears to be large tonnage available, the location is ideal for quarrying, and close proximity to the railway provides transportation facilities.

### Plan to Build South Dakota Cement Plant

"UNLESS some unforeseen obstacle arises to alter our present plans we expect to let a contract for the construction of the commission's cement plant at Rapid City, S. D., this fall," A. L. Wyman of the South Dakota State Cement Commission is quoted in the *Argus-Leader* as saying.

The commission intends to hold a meeting this month, when several matters of importance to the early commencement of operations will be gone into, including the right of way, a decision as to what to do for power and shale, and matters connected with the best type of factory and machinery to secure.



# Will Coal and Rail Strikes Close Rock Products Plants?

The situation in the rock industries is serious enough; complete shut-downs are freely predicted because of conditions beyond the operators' control. Yet optimism is freely sprinkled through the impatience which here and there quite naturally crops up. Typical letters from producers present below an excellent picture of the situation

UNLESS both rail and coal strikes end promptly many plants producing cement, lime, stone, and gravel will be closed within a month, if forecasts of the past week by leaders in these industries come true. One producer writes under the date of August 7: "We have only a few days' supply of coal on hand at the present time; so far as we can see, most of our plants will be down by the end of August." Another writing on the same day says: "We cannot get any coal. It looks like a shut-down, as our present supply will be exhausted in five weeks."

From everywhere come complaints of the high prices of coal, despite the recent steps taken by Secretary of Commerce Hoover to prevent such a situation. While service order No. 23 of the Interstate Commerce Commission giving priority and preference in the assignment of cars seems to have had little harmful effect during the two weeks since it was passed in limiting the supply of cars to aggregate producers, the result of that order as soon as the coal strike ceases and production in that industry starts to increase is much feared. In many instances railroads are notifying gravel and stone producers that no cars are likely to be available as soon as the coal strike ends and shipments commence from the coal fields at present idle.

It is these two situations, a shortage of coal to maintain operations, and a shortage of cars in which to make shipments, that face rock products producers and which are likely to cause them serious difficulties, if not large financial losses, during the months to come. The lack of coal hits cement, lime, and gypsum producers the more, while it is the gravel, sand, and crushed stone producers who will be more seriously affected by the shortage of open top cars.

On the other hand, considerable optimism for so serious a situation is shown by producers in these industries, as quotations below indicate.

To get a picture of the situation, Rock Products asked a number of producers in various parts of the country several

questions as to coal and car supply, and possible remedies for the situation. The foregoing gives briefly the outstanding points of the many replies received. A much more definite summary of existing conditions may be gained from the typical replies which have been selected and printed below. Almost universal is the complaint concerning excessive coal prices, while the suggested remedies are both varied and worth careful consideration.

## What Cement Producers Think

The first reply published has a particularly optimistic tone. It is from F. A. Sinclair, assistant secretary of the Edison Portland Cement Co., and it includes a restatement of the original questions asked. Mr. Sinclair's reply follows:

What is your average weekly or daily consumption of coal? A. 450 tons daily.

What stock did you have on April 13? A. Forty days' supply.

How much coal have you now? A. Ten days' supply.

Have you experienced serious difficulty in securing coal? A. No, if we pay the price.

Are you now receiving, and do you expect to continue to receive an adequate supply? A. Yes.

What special steps are you taking to obtain sufficient coal? A. None, other than tracing cars to expedite delivery.

How do your railroad shipments for the first seven months of 1922 compare with those of a similar period in 1921? In 1917? A. Just as good until August 1, when the car shortage became noticeable.

Did the rate reduction effective July 1 have an appreciable effect in increasing rail shipments? A. Yes.

Has service order No. 23 of the I.C.C. establishing preference and priority in shipments reacted to your disadvantage? A. No, we are not taking coal from the roads affected.

Do you consider that this order will seriously affect your shipments, and to what extent? A. No reason to believe that it will.

Another cement maker, G. S. Brown, president of the Alpha Portland Cement Co., finds much less hope in the situation. The plants of this company are located in New York, New Jersey, Pennsylvania, and West Virginia, and the situation as the president of the company views it is as follows:

"We have only a few days' supply of coal on hand at the present time; serious difficulty is experienced in getting it and, as far as we can see, most of our plants will be down by the end of August.

"Our shipments for the first seven months of 1922 are very much in excess of the same period in 1921.

"The rate reduction on July 1 did not appreciably effect an increase in our rail shipments.

"Service Order No. 23 of the I.C.C. has not reacted to our disadvantage as yet, nor do we expect that it will.

"The only remedy that we can suggest is the ending of the coal miners' and shopmen's strikes.

"I think that we are all going to be very greatly inconvenienced and most of us will lose a good deal of money before the end of this year by reason of these strikes."

## From a Wisconsin Operator

In Wisconsin, according to John J. Sloan, president and general manager of the Waukesha Lime and Stone Co., it is impossible to secure coal, and his operations will soon be closed down. The company uses 50 tons of coal weekly in the production of sand, gravel and several limestone products, and after stating that he cannot get any coal now Mr. Sloan says:

"Have made constant inquiries and it looks like a shut down, as our present supply will be exhausted in five weeks.

"Our railroad shipments for the first seven months of 1922 just about balance for the same period in 1921; 1922 shipments exceed 1917 by 20 per cent.

"The rate effective July 1 has not increased shipments as yet, as practically all our business had been contracted for



prior to July 1, and no business has developed as yet where the newly made rates would apply. We expect to see an increase, however, when new work develops.

"Yes, Service Order No. 23 has already resulted in a lessened supply of cars, which is resulting in congestion as well as delay in various jobs under way, and we are particularly affected by the poor condition of the bulk of the equipment now being furnished us, resulting in expense and delay to us in having to repair the cars.

"To what extent Order No. 23 will affect our shipments will depend upon the enforcement of same. The few days it has been effective we would say 20 per cent.

"In the present crisis, we believe that the government should control profiteering by the coal producers, and if the miners will not work for a scale that an arbitration board, with all facts before them, deem fair to the owners, the miners and the public, then other men, who are willing to work, should be given the opportunity to work and government protection provided.

"Every basic industry has a stock-pile except the coal mine; note that the brick yards, stone quarries, copper mines, blast furnaces, iron mines, and thousands of others all maintain stocks. A stock-piling coal would cost about 25 per cent a ton additional, and would be offset by continuous operation of the mine, thus lessening the unemployment of the miners, which is their principal contention today. The mines do not operate unless there is sufficient car supply for the day's operation. No greater danger would result in the storage of coal at the mines than in the bins of the consumers, and it would mean more uniform movement, thus lessening the discrimination to firms using the same type of equipment that coal mines do. The stock-pile would not only insure steady operation and continuous employment for miners, but during the dull summer season a portion of at least the 800,000 miners (said to be double the amount necessary to mine the 12,000,000 monthly tons needed) could be released for seasonal work in other occupations, to the benefit of all industry."

#### Eastern Crushed Stone Operations

The General Crushed Stone Co., which operates several large plants in the East, has found business unusually good this year, but the coal strike is beginning to affect shipments of ballast to roads whose coal supplies are low. John Rice, the company's president, complains of high coal prices, but otherwise takes a rather optimistic view of the situation. Mr. Rice says:

"Our average daily consumption of coal is about 150 tons. (Three of our quarries are operated by electricity, fuel being

used only for steam-shovel operation.) We bought about 6000 tons of fuel for delivery during the spring months and have enough on hand to last until about September 15. We have had difficulty in securing coal during the past month, but by paying the price, of from \$4 to \$8, we have secured an adequate supply, as stated. We are taking no special steps to secure coal, but merely keep about a month head as best we can.

"Our railroad shipments up to date have been very satisfactory both with respect to expeditious movement as well as car supply. Also, our deliveries of ballast to the railroads have been on a substantial scale and taken with perhaps better than normal regularity. We do not know whether the rate reduction of July 1 has had any appreciable effect on increasing business or not, because of the fact that our business has been very satisfactory throughout the season at all our operations.

"So far Service Order No. 23, with reference to preference and priority, has not affected us. We of course believe if this order is used widely and effectively it must necessarily affect our business. We are just now beginning to feel the effect of the coal shortage by reason of one of the large railroads shutting off ballast temporarily because of a short fuel supply, claiming that it is not the effect of the railroad strike but only of the coal strike. This is the only effect of either strike we have felt in any way up to the present writing, except with respect to the price of coal.

"We are assured that this suspension of ballast is only temporary and may last only a few days or a week and that much will depend upon the action of the coal operators and miners at Cleveland. In other words, if coal is mined this specific suspension order for ballast will be annulled and ballast shipments revived. However, we do feel that if the various strikes continue for a few weeks longer there will be such a demand for fuel that all the available rolling stock of the railroads will be utilized in the movement of coal and that we will have difficulty in securing additional supply of coal, or, if we can get the coal promptly, we will not have cars for shipments of stone. We are not crossing this bridge until we arrive at it.

"We see no steps that we can take to protect ourselves in this direction, believing that it is perfectly reasonable to suppose that the railroads will take their ballast if they have the means of taking it and that they will supply us with cars for our business if they have the means and equipment to do this, for perfectly natural and logical reasons, and that if they don't do it it is because they can't, because of the demand for fuel and equipment by interests with reasonable prior

and preferential claims for attention."

New England conditions are indicated in a message from W. Scott Eames, general manager of the New Haven Trap Rock Co.:

"Our usual coal consumption is 125 tons weekly; present stock, two months' supply; are receiving coal at advanced prices; urge buying the coal at once. Expect serious shortage if strike is not settled by September 1. We are buying at market prices.

"Our rail shipments will amount to about 30 per cent more than in 1921. Our reduction of freight went in last fall; only in a few instances did we have a decrease in July. Our rail shipments have certainly increased enormously over last year. Order I.C.C. has not affected us at present. This order will seriously affect us if strike is not settled by September 15.

"Our railroad officials called a conference of stone men of New England last week and assured us that there is no immediate alarm about curtailment of cars until strike is settled and production of coal is well under way. We are receiving coal at New Haven by steamer from Norfolk, Va. During the last three months, the port of New Haven has received close to 750,000 tons."

#### Not So Bad as 1920

Alex W. Dann, vice-president and treasurer of the Keystone Sand and Supply Co., and president of the National Association of Sand and Gravel Producers, is in close touch with the situation through his frequent visits to Washington to appear before Congressional committees on the matters of freight rates and car supply, as well as through the Washington office of the association. His statement, therefore, that sand and gravel producers are likely to get a more equitable deal in the present situation than in 1920 should carry much weight. Mr. Dann's statement follows:

"We have on hand a small stock of coal and are buying it where we can and paying what we have to, which price is very high. We do not know how long we will be able to get enough coal to keep us going.

"When you ask your second question you get into a little more definite field. To start with, we did not get a reduction in freight rates effective July 1 since we had already secured a reduction on October 1, 1921. Our railroad shipments for the first half of 1922 amount to about 50 per cent of our rail shipments in 1917. This is counting the whole year of 1917 against the first half of 1922. Our tonnage is rapidly leaving the rails and going to trucks and water delivery. Service Order No. 23 has not seemed to affect our shipments so far. Our opinion is that when coal production comes back to normal we will get but few cars. How-

ever, we think that the sand and gravel producers will get a more equitable deal than they did in 1920. The situation is different than it was in that year inasmuch as this is an emergency and that was not."

Stop exports of coal, especially to Canada, is the suggestion of J. E. Carroll, of the J. E. Carroll Sand Co., of Buffalo, to bring relief to the situation. Coal shortage does not affect Mr. Carroll's electrically driven operations, but the anticipated demand for open-top cars for coal when the strike ends is likely to curtail his car supply. Mr. Carroll says:

"Rate reduction effective July 1 has had no appreciable effect in increasing rail shipments for the reason that New York State did not share in the 40 per cent increase.

"Service Order No. 23 of the I.C.C. is beginning to show a reaction to our disadvantage. We consider that order will seriously affect our shipments probably 20 to 25 per cent.

"Would suggest as a remedy that a maximum base selling price at the mines be enforced, and that no soft coal be exported to foreign countries, especially Canada. It is a matter of common knowledge that in the troublous times of 1920 trainload after trainload of bituminous coal crossed the Niagara frontier destined for Canadian points, while larger industries on the American side of the frontier, including Buffalo, Niagara Falls, and Western New York generally, had to close plants and stand by and watch train loads of coal cross Niagara river bridges at Buffalo and Suspension Bridge."

#### Where Slate Producers Stand

The situation for the slate industry in Pennsylvania is summed up in the following statement from William H. Smith, secretary and treasurer of the North Bangor Slate Co.:

"So far as our industry generally in Eastern Pennsylvania is concerned, the following would be the approximate answers to the various questions you propose:

"Average weekly consumption of coal in this industry, 600 tons. Stock on hand April 13, approximately four months' supply. Present stock on hand three or four weeks' supply. No very serious difficulty has been experienced in securing coal provided we were willing to pay the excessive price asked, which at the present time ranges about \$7 to \$8 per ton at the mines. The present supply being received is inadequate and unless increased somewhat will cause some stoppages. No special steps have been taken by this industry as a whole to secure coal.

"Railroad shipments from the Pennsylvania slate industry for the first seven months of 1922 are much larger than in 1921—perhaps 60 per cent greater. They

are not nearly so large as in the same months of 1917—perhaps 40 per cent less. The rate reduction effective July 1 has had some effect in increasing rail shipments, as it caused the placing of orders which had been held back until the freight rate situation was settled. Up to the present time we have not noticed any disadvantage to our service by reason of service order No. 23. Should this order continue in effect for an extended period it will undoubtedly tend to restrict our shipments.

"It appears to us that both the coal strike and the rail strike must be fought

to a successful conclusion. There is no just reason why the coal miners and the railroad men should not do their part in the business readjustment that has been taking place. The scale of wages of these classes of workmen threw the cost of fuel and transportation out of balance with the price obtainable for other commodities. The rail strike we believe is beaten. The bituminous coal strike can be beaten if the railroads having equipment in good condition will give sufficient assistance in motive power, cars, and mechanics to the soft coal roads serving the non-union fields."

## Roads to Aid Wisconsin Producers

It is believed by the Wisconsin Mineral Aggregate Association officials that Tuesday, August 8, will "go down as a red-letter day in its history." Not only did the executive board hold a very successful conference with officials of the Chicago, Milwaukee and St. Paul, and Chicago and Northwestern Railroads, but were able to establish the identity of the association as comprising the foremost shippers on these lines in Wisconsin. The association is commending the board in bringing about this condition.

In the morning the board met the following officials of the C. M. & St. P.: H. E. Byram, president; R. M. Calkins, vice-president; H. E. Pierpont, traffic manager; J. T. Gillick, general manager, and G. L. Whipple, superintendent of transportation.

Mr. Byram assured the board that the railroad is making every effort to keep their car supply up to 100 per cent and that they, at this time, have a surplus of approximately 198 idle engines which could be pressed into service as fast as needed. Their supply of open-top equipment is not over-abundant, but practically all of the new open-top cars recently purchased are in service in Wisconsin, and their intention is to keep these cars here as long as it is possible. The present regime of this road is bending every effort to better its service, as it realizes its shortcoming in the lack of equipment, which they are gradually overcoming by the purchasing of new.

The board was assured that up to the time the coal strike is settled, the road would be able to give 100 per cent service.

It was brought out by Mr. Byram and the officials that, as far as the C. M. & St. P. is concerned, the situation is somewhat different than that of 1920, insofar as this road is now a coal-producing or coal-carrying road, owning their own

mines. They feel that their equipment will not be scattered all over the country, but will be confined to their own line, being under their direct supervision, and in this way any surplus will be given to producers.

President Byram and the officials were very cordial in their treatment, realizing that the association represented approximately 90 per cent of the aggregate produced in Wisconsin. It was evident that they appreciate and want this revenue that is earned in carrying mineral aggregate and the statement was made by Mr. Calkins that the loadings of this material showed an increase of 280 per cent over the previous year.

In the afternoon Mr. Finley, president of the C. & N. W., in explanation of the present car shortage, gave the reason that when the shopmen's strike was first called his road was loath to go out in the open market for men; consequently, the equipment rapidly got in poor condition. The past few weeks, however, they have been hiring men at the rate of approximately 200 per day, and felt that the service would be improved daily. The shortage of the past 10 days was also partly due to the street-car strike in Chicago. The road was called upon to carry an increase of 100 per cent in the suburban service, consequently every available engine was pressed into this service.

This road has plenty of open-top equipment; in fact, such a large supply that they have at the present time thousands of cars in the direction of the mines awaiting the resumption of mining. Today they are giving the aggregate producers approximately 25 per cent of their car requirements, and it was brought out that this should not be a daily average, but based upon the weekly car requirements.

Mr. Walters, general manager of the C. & N. W., gave assurance that they would do everything in their power to furnish cars based upon the weekly average; in fact, he was of the opinion that they would constantly be able to give more cars and that four days after the railroad strike is settled that they would give the producers 100 per cent service.

In the discussion of the producers' limited season, Mr. Walters said that they would be able to give this service up to

and including November 1, regardless of what may develop. In the advent of the mine strike being settled and Service Order No. 23 becoming effective, the C. & N. W. officials felt that it would be possible for the producers to load cars in the direction of the mines, it being their intention, regardless of the necessity of the coal situation, to have every open-top car earning revenue and not standing idle on some mine siding or in some terminal. It is also their opinion that it would be

impossible for the Interstate Commerce Commission to order any C. & N. W. cars out of their jurisdiction as long as there was need for cars on their line.

The association feels that it is now in a position where its wishes will be respected and granted. All officials believed that in order to expedite the movement of cars, the members could co-operate with them in warning the contractors that all cars must be unloaded within 24 hours after receipt.

# What Highway Engineers Think of the Situation

Road programs are being held up, and highway officials doubt the possibility of meeting schedules because of the coal and rail strikes and the priorities order

**A**MBITIOUS programs of road construction for 1922 already are suffering in many states from coal and rail strikes, and unless relief comes promptly the end of the year will find many states far behind the schedule planned at the beginning of the year.

State highway officials are decrying the conditions which cause this slowing up, and while in most cases contractors have been constantly urged to build up supplies of materials in anticipation of a car shortage, the removal of open-top cars from use for aggregate shipments would affect approximately 50 per cent of the remaining 1922 work.

Due either to adverse weather conditions or difficulties in obtaining materials, the road programs in most states seem to be behind schedule; from 60 per cent to 75 per cent of the 1922 work remains to be done, and from 50 per cent to 80 per cent of this remaining work depends on rail shipments of sand, gravel, stone, and cement.

Few state highway officials venture criticisms of the car priorities order. They accept it as for the best good of the largest number. A. R. Hirst, state highway engineer of Wisconsin, on the other hand, does not hesitate to denounce the order of things which results in present conditions. In a letter written August 8 to Rock Products he says:

"Our 1922 road program is approximately on schedule. Although slightly behind last year's record of the same date, last year was an extraordinarily favorable year in every respect and we did not expect to duplicate it. The performance to date this year is ahead of any performance other than last year's.

"Our year's program is probably approximately 40 per cent completed; that is, 60 per cent remains to be done.

"Practically all of the remaining concrete surfacing depends upon rail shipments of cement, stone, gravel or sand. The concrete road program is approximately 40 per cent completed, like the other work. Of the remainder very little can be completed with the supplies of cement at present in the state. We would not expect, however, that the supply of cement would be the determining factor in completing this work. About 40 per cent of the remaining concrete construction does not depend upon rail haul of aggregate. We are expecting to finish this work in course of time unless something very unexpected happens to the cement business.

"It is difficult to state whether the present stoppage of cement mills and of rail movements is due to the coal strike or to the rail strike or to the priorities order. From one or the other or all of these causes, however, the shipment of cement into Wisconsin is very much restricted, and the movement of open-top cars of aggregate is also seriously impaired.

"It would take a wiser man than I to estimate the effect of the priorities order on our construction. Its effect will be more marked the longer the coal strike is continued, and if the idiots in charge of the rail situation as to open-top cars, pile cars into the coal mines when the coal strike is ended, regardless of loading and shipping abilities of the railroads south of us, we will probably be denuded of open-top cars just as we were in 1920,

without any consequent movement of coal.

"The seriousness of the situation is that there is never any judgment used as to the movement of open-top cars. They are piled up in the coal states with the weeds growing around them, sometimes for weeks, while hundreds of men are refused employment in the non-coal states because there are no open-top cars to furnish the materials needed for employment.

"I cannot state whether the priorities order was necessary, but I assume that it was. There would certainly seem to be no reason for putting one in effect except that it was needed, and in the absence of other information we have to assume that the Interstate Commerce Commission has some brains.

"Undoubtedly not only the highway industry, but all other industries, have been placed in a very serious position and condition by the prolongation of the coal and rail strikes. Possibly those in power can give some reason for playing with the coal strike three months before anybody turned a hand to end it, but from the comment in Wisconsin it will have to be a pretty valid reason because the inactivity of Washington and other authorities has again effectively strangled all business at a time when every ounce of breath was needed."

Several other letters written during the past week to Rock Products are published below. They present the situation in seven other states as to highway construction and the results of the coal and rail strikes and the priorities order:

Our 1922 road program is not up to schedule due first to the rainy weather



which has been experienced during the season and to labor conditions. About 70 per cent of the program remains to be done. Of the materials necessary in the work remaining for completion, about 60 per cent depends upon rail shipments. The priorities order of the Interstate Commerce Commission has not as yet had any effect on our work. It is impossible to estimate what the effect of this order is going to be, as it will depend entirely upon future developments. However, it is fair to assume that if the coal mines resume operations in full in the very near future that it will have a more or less marked effect upon the supply of equipment available for road building work. To lessen the effect of such conditions, if they should develop, we are urging contractors to get their materials onto the work at the earliest possible date. In this connection we suggest that a modification of the priority order permitting the loading of coal cars to points which are in the general direction of the empty return movement to the mines will be beneficial.

HERBERT S. Sisson,  
New York State Highway Commissioner.

#### **Anticipating a Car Shortage**

The provision of the New Jersey state highway commission for paying contractors a large percentage of the cost of materials as soon as delivered to the job is a step worth copying. Mr. Wasser says:

The 1922 road construction program in New Jersey of state highways calls for the construction of 129.6 miles of highway of hard top, such as reinforced concrete, or a concrete foundation with a bituminous surface, such as sheet asphalt, or bituminous concrete.

At present 60.7 miles have been completed, or 41.8 per cent. Of the roads still remaining uncompleted, the completion is approximately 40 per cent.

A month or more before Service Order No. 23 was issued, contractors on state highway work in New Jersey were advised to lay in stock of materials, so that work would not be delayed if the Interstate Commerce Commission found it necessary to issue orders restricting the use of open-top cars for transportation of road-building materials. The state highway specifications provide that the contractor may be paid not exceeding 80 per cent of the cost of materials on the ground, but not incorporated in the work. You will see that this is a great advantage to the contractor in emergencies such as the present one. For that reason Service Order No. 23 has not yet affected our road construction.

The thing that has affected the road construction has been the fact that the producers of stone, sand, and gravel have oversold their output and are unable to ship enough material to accommodate our road-building contractors.

T. J. Wasser,  
New Jersey State Highway Engineer.

We have not yet received sufficient information regarding proposed priority orders of the Interstate Commerce Commission to know just what effect such orders are likely to have on our road program. At the present time our road program is not up to schedule. A number of our paving jobs are either seriously hampered or closed down altogether by the railroad strike, and it does not appear likely that it will be possible to complete all work proposed for 1922 construction. Naturally, any further restrictions which the Interstate Commerce Commission may place upon the use of open-top cars for transporting materials will only handicap us to that much greater extent.

We are disposed to think that any priority orders issued by the Interstate Commerce Commission will be issued only after careful and mature consideration has been given the problem. It appears that there will almost inevitably be a fuel famine in certain sections of the country this coming fall and winter. We do not wish this fuel famine to be aggravated by failure on the part of railway officials to use available open-top cars to the best possible advantage. We naturally will regret having our road program hampered by restrictions placed on the use of open-top cars, but we are willing to accept the decision of the Interstate Commerce Commission in regard to the use to which this equipment should be put.

C. COYKENDALL,  
Assistant Chief Engineer, Iowa State Highway Commission.

Our 1922 road program is not on schedule at the present time. We have encountered exceptionally heavy rains during the spring and early summer of this year which have seriously delayed our contractors.

I would estimate that approximately 75 per cent of our work remains to be done. I would estimate that at least 80 per cent of the remaining work depends upon rail shipments.

The priority order of the Interstate Commerce Commission has not yet affected shipments of materials, with the possible exception of cement from one plant.

I estimate that if the priority order remains in effect that it will probably reduce the remainder of our program to about 50 per cent completion.

All contractors in this state have been warned several months in advance of a possible car shortage and have been urged to collect a supply of materials for an emergency, but to date very few of the contractors have been able to store sufficient material to run for any considerable length of time.

I have not sufficiently investigated the rail situation to advise as to the necessity of a priority order. In general I do not favor priorities. For the last few years the words "embargo" and "priority" have

become a menace to the country. While they may be necessary in certain instances, I believe that this condition should be left to the railroads for their own determination. It gives an opportunity for lobbying by well organized industries to secure the cars which they need to the disadvantage of other industries.

M. W. WATSON,  
Highway Engineer, Kansas State Highway Commission.

Up to the present time, the priorities order has in no wise affected our work; at least this department has had no complaints nor information to the contrary.

As regards our schedule of construction work, there still remains approximately 60 per cent of the program to be completed. On account of weather conditions our work has been delayed, roughly speaking, about three weeks. In view of the possibility that the priority order may eventually affect the work of this department, we are gathering the necessary statistics so that we will be in a position to take immediate action should there be any delays occasioned thereby.

W. D. UHLER,  
Chief Engineer, Pennsylvania State Highway Department.

We do not anticipate any serious delay on account of the priorities order, as shipments on our paving program are considerably ahead of schedule. It seems to us that this order was justified by the conditions, and should be a good thing for the country in general.

O. L. KIPP,  
Construction Engineer, Minnesota Highway Department.

The priority order on open-top cars is materially injuring the road program of this state, some of our surfacing contracts at this time being entirely dependent upon rail shipments. I have had this matter up with the car service section of the Interstate Commerce Commission, but so far have not obtained any relief. Kentucky will need about 8000 open-top cars between now and December 1, 1922.

JOE S. BOGGS,  
Highway Engineer, Kentucky State Highway Department.

Approximately 75 per cent of our work is yet to be done. The bulk of this work depends upon railroad shipments.

Concerning priority and its effect upon our road work, any one knows that if the priority does not permit of the shipment of road materials, there is no opportunity of carrying on road construction.

Today we are operating all right. Tomorrow we may be shut down.

LEON C. HERRICK,  
Director of Highways and Public Works, Columbus, Ohio.



# Mixing Safety and Cement in Lehigh Portland Cement Plants

How 4200 employees have enthusiastically absorbed the essence of the big safety idea. This is a sermon, preached from a text made on the grounds by the editor of the National Safety News, which deserves a large audience

By George Earl Wallis

THIS is a story of that intangible yet easily recognized something called "spirit"; an account of how the 4200 employees of the Lehigh Portland Cement Co., working in mills and quarries in somewhat isolated corners of half a dozen states, have absorbed with enthusiasm the essence of the

apothecary's pestle and mortar grind the clinkers into impalpable powder so fine that 78 per cent of it will pass through a sieve containing 40,000 meshes to the square inch, and in the packing house where cement is blown into 94-lb. sacks ready for the shipping platform, there are inherent hazards

hand rails, toe boards, belt guards, quarry safety houses, and the numerous other mechanical safety devices used, cannot entirely overcome.

The interest of the individual worker in the safety proposition has brought excellent results. The annual interplant no-accident contest held during June attracts more general interest than any other event of the year. Safety parades led by employees' bands and followed by meetings participated in by employees, families, and friends start the campaign each year at several of the plants. Moving pictures, to be shown at the next community safety rally, were taken of the parade at the Omrod, Pa., plant held June 1, last, in which 1200 persons took part. Stump talks, special speakers, and daily meetings are campaign features in every plant.

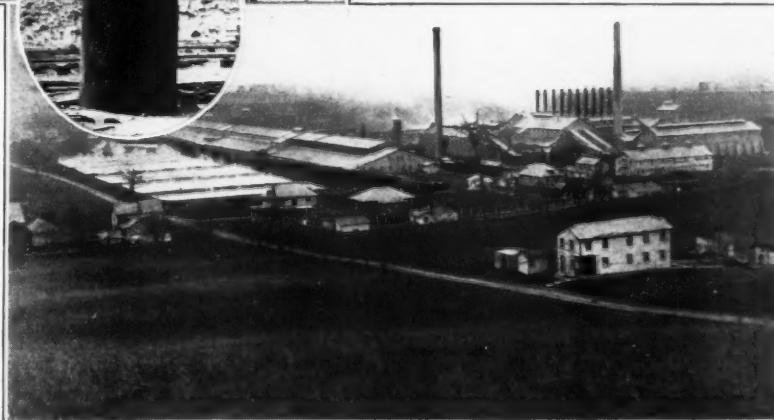
Last year the June no-accident campaign resulted in 17 accidents with 108 days lost. This year there were but 12 accidents with 67 days lost. In 1921 five mills received



Section of Omrod quarries

big safety idea and are putting into their daily work an earnest application of practical accident-preventing thought that is directly reflected in the ever decreasing number of accident reports coming in to the company's general offices at Allentown, Pa.

The cement business is especially one in which guards alone do not eliminate dangers. In the quarry, for instance, where tons of blasting powder are used at one time in cracking off 70-ft. slices of limestone and cement rock, safety depends chiefly on the individual care and watchfulness exercised by the men. And in the handling of large quantities of rock in the quarry, in the rock crusher house, in the raw mill where heavy machinery further breaks up the rock, in the kiln house where the crushed material is burned in a temperature of 2500 deg. and greater, in the grinding room where machines like monster



Fogelsville mill—a typical cement making plant; a quarry safety house is shown in the circle

to the worker's eyes, hands, and to his perfine large American flags donated by the subway grating, the colored goggles, the

pennants for going through the month without an accident; this year 10 mills received son in general that the guards of heavy



**A safety parade and mass meeting opened the annual no-accident month at the Omrod, Pa., Lehigh Portland Cement plant on June 1**

company. These banners are prized very highly and taken out only on special occasions. Close rivalry exists between the employees of the different plants. The Mitchell, Ind., mill last year lost the pennant with but one accident and one day lost; this year that blot was wiped out by a spotless 30-day record.

"I tell ye, boys, I would love like a brother any man who would tell me to mind my step and watch out lest I get hurt; and I'm telling every man Jack of you that the wives and babes at home look to us to see that their Jim, Mike or Bill comes back safe to them at night."

These words, accompanied by fist-in-palm punctuation, greeted me as, in company with Major Henry A. Reninger, head of the safety and welfare department, I stepped into the room where John Ball, old-time marine engineer of the English seas and for the past 20 years superintendent of the West Coplay, Pa., plant, was holding a noonday "talk-it-over" with 30 or more foremen and workmen—one of many similar meetings held during the recent June contest.

Later, at the conclusion of one of the best plant safety meetings I have ever attended, while on our way through the company's fields of excellent corn and ripening wheat behind "Safety Billy," John Ball's old white horse, I heard more of his safety Golden Rule philosophy and got a glimpse of that spirit which made it possible for the 400 men in the West Coplay mill and two quarries to make the best safety record among the 15 plants of the company last year and, incidentally, among the 100 or more member-plants of the Portland Cement Association for the same period. The men here, proud of their 1921 record, got together one night and built on the side of a hill a safety sign of old kiln brick which may be seen with ease two miles away.

"What do you hold as most important in the fact that serious accidents to your employees have decreased almost 50 per cent during the past four years?" I asked Vice President D. E. Ritter, in charge of the manufacturing end of the business.



**Superintendent John Ball, safety evangelist, preaching the accident prevention gospel from his West Coplay pulpit**

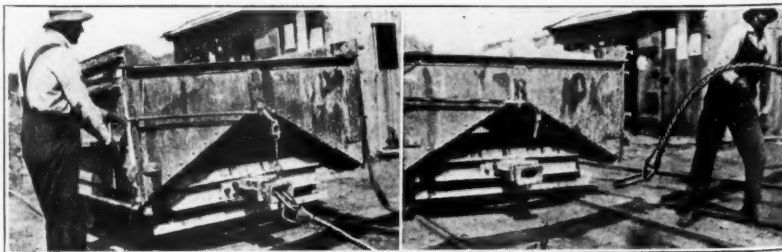
"The enthusiastic support of all our employees in the work," was his immediate reply, disclaiming any personal credit. "I believe that our experience substantiates the now established fact that best results follow when the management takes a definite accident prevention stand.

"We early tried to make our plants as mechanically safe as possible. What was the effect? An active interest in safety from superintendent to quarryman that has made our original effort one of continuous and lasting effect. When men find time in their everyday work to keep an eye out for the other fellow's safety, the outcome is obvious. We have been fortunate in this respect and are depending on this spirit of co-operation to make possible still further accomplishments in preventing accidents."

Recognizing the importance of employee help in this work, the mills having already been well equipped with guards, the company, back in 1915, made a definite bid for the interest of the working forces by establishing plant central safety committees. Committees of from 7 to 14 members were organized at each plant and made responsible for all accident-prevention work, ways and means being left to the local committee and the management to work out. As a committee nucleus, the superintendent, the master mechanic, and the chief electrician were appointed as permanent members. The remainder were foremen appointed for six-months terms by the plant manager. Every plant foreman has served one or more terms on a committee and workmen are now gradually being brought into the membership. Sub-committees selected from the committee membership attend to special work such as monthly plant inspection, fire inspection, sanitary inspection of mill and



**Large sign built by Lehigh Portland Cement employees out of old kiln brick on a hill top and visible two miles away**



**Where the "barney" is not used, this safety device prevents accidents to workmen, who otherwise would have to step in front of the car to unhook the cable**

employees' homes, and first aid, and make reports at the monthly meetings.

The company gives each plant committee

the superintendent will bring immediate action. The superintendents, reflecting the attitude of the company, lend an attentive

ear to all suggestions made in the interest of increased protection in the mill or quarry. Occasionally, recommendations come to the main office for approval, but when they do they are supported all along the line as improvements making for increased efficiency and safety.

While this company has not as its objective the establishing of safety records, still there are certain facts that deserve mention and which stand out as proof of what a "pull-together" spirit can do to accidents.

At the 10 large quarries where the annual total rock tonnage runs into the millions, there was neither a fatality nor a permanent total disability, and but two partial disabilities, during all of 1921. At the Omrod quarry, the largest one of the group, over 300,000 tons of rock have been taken out so far this year without one lost-time accident.

First-aid work and hospital care for all minor wounds and abrasions are emphasized



*Lehigh Portland Cement employees live in neat cement company bungalows*

a check for \$100 annually to use in whatever manner the members think best in their general safety educational work. At the Fordwick, W. Va., plant the money is used for the showing of safety movies and the holding of an annual safety corn roast picnic. The Oglesby, Ill., committee members recently spent their check to buy a sterilizer for the hospital in memory of the plant chemist who died during an epidemic in which he gave unstintingly of his time and strength attending the sick. Special safety meetings, illustrated talks, first-aid training are some of the other things for which the various plants spend their money.

It is common knowledge among Lehigh men that when anyone finds a condition which some day may mean an accident, a report to the central safety committee or



*Employees take an active interest in all Lehigh Cement no-accident campaigns*



*Banner won by the West Coplay organization in the no-accident contest of 1921. Seated in the center is Superintendent John Ball. At the extreme right is Major Henry A. Reninger, head of the company's safety and welfare department*

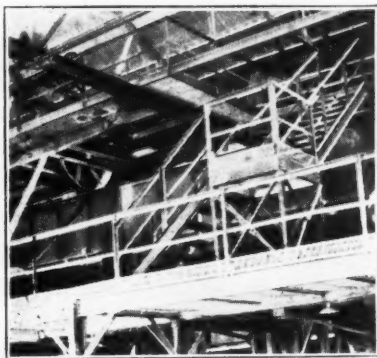
at every plant. Employees have been taught by their own safety committeemen to report immediately for treatment of all cuts and scratches. At the Mason City, Iowa, mill an employee—at one time a mine first-aid man—voluntarily passes his experience on to his fellows at regular classes held on the subject; accidents in this plant have decreased over 75 per cent in the past two years. So complete has the process of education been that during the past 18 months not a single lost-time case because of an infection has been recorded throughout the entire organization. Credit for this must also be given to the plant doctors. At the Omrod plant, a good-sized place, where Dr. H. D. Leh looks after the welfare of the employees and their families, there is no record of any infections from any cause for the past six years.

The success of accident elimination is best judged by years, not by months or weeks. Lost-time injuries at the West Coplay plant have been reduced from .501 of a day lost per 1000 man-hours worked



in 1918 to .018 of a day lost in 1921, the latter period without one compensation case. The best record for the four-year period is held by Newcastle, Ind., plant No. 1 with an average of 29.6 days lost per 100,000 man-hours.

Total time lost at all plants because of



**Well guarded platforms at Omrod**

accidents from January 1 to June 1, 1921, was 2807 days. The same number of men working practically the same number of days for the same period this year lost only 867 days. At the Iola, Kans., plant, during the same period in 1921, with 400 employees, 440 days were lost. The first June safety campaign was held in 1921. From that time to May 11, 1922, this same plant went without one lost-time accident and in the 13 months up to July 1, there has been only one case of lost time.

These are only a few of the outstanding accomplishments made possible by the *spirit* of co-operative effort so characteristic of this company's accident prevention activities.

There exists a community consciousness at each plant that makes safety work all the more effective. At Fogelsville, Pa., a company town seven miles from Allentown and four miles from the nearest trolley, the employees some time ago held entertainments and raised over \$3,000 with which to equip a community park. A nearby piece of wooded land was donated by the company; the men then cleaned out the brush,

trimmed the trees and made the strip of woods into a first-class pleasure spot. Here the wives of the workmen come on summer afternoons to enjoy the shady nooks and watch the children at play. A dance pavilion with floor space 30 by 110 ft., a good baseball diamond with a natural grandstand, an old cement water reservoir as a swimming pool, in addition to playground apparatus for the children, make the Lehigh Community Park, as it is called, the equal of any larger city place of recreation. It is free to all and is maintained by the employees through a president and board of directors.

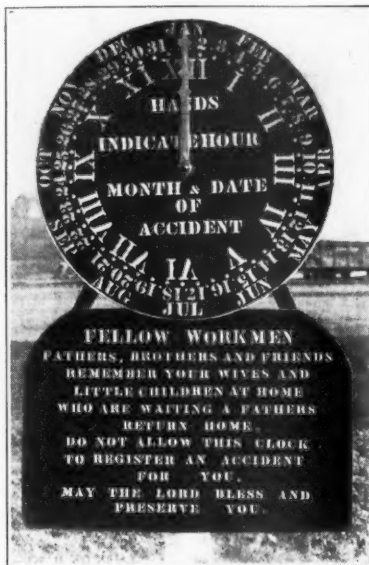
The spirit of the rank and file is backed by continuous and thorough maintenance of mechanical safety equipment on the part of the company. A safety inspector travels from plant to plant checking up daily on the condition of equipment and guards.

At Fogelsville every department is electrically connected up with the power room

must always go together when any firing is being done. In case one should slip and sprain an ankle, or otherwise injure himself while running to cover after the fuse has been lighted, his companion is there to carry him to the safety house before the blast comes.

A complete poster service which includes both National Safety Council and excellent home made bulletins, is maintained by the safety and welfare department. Posting is under the supervision of each central safety committee, a new bulletin appearing simultaneously in all plants weekly.

Lehigh spirit is winning the battle against accidents. It is the foundation cement which holds theory and practice together and makes employment in the mills and quarries of the Lehigh Portland Cement Company a pretty certain guarantee against injuries, pain and loss. The words of the legend at the bottom of the 12-ft. safety clock built by the West Coplay men, best exemplifies this spirit.



**The 12-ft. safety clock**

so that in emergencies, when the life of a workman is in danger, the machinery may be shut off without loss of valuable time. In this plant, also, a heavy subway grating 10 ft. wide extends the entire length of the finishing room as a protection to workmen walking back and forth under the overhead, horizontal belts; this grating is strong enough to support men in repairing pulleys. Standard grating is used for the flooring of most overhead walking platforms. On all cone pulleys in the machine shop—a typically well guarded place—belt shifters are used entirely.

In the quarry, the red safety houses of 3/16-in. steel offer a ready haven from flying rock when blasting is under way. A strict rule, which has averted many a catastrophe in the quarry, is that two men

## California's Cement Output

**C**EMENT is the most important single structural material in the output of California. During 1921 there was produced a total of 7,404,221 bbl. valued at \$18,072,120, a new high record for that state, being an increase both in quantity and value over the record figures of 1920. As in the preceding year, the output came from nine operating plants in seven counties.

The cement industry is so distributed in California that it is not possible to apportion the details of production to the counties in which the plants are located without making private business public. With the exception of San Bernardino, no county has more than one cement plant. The three operating plants in San Bernardino county, in 1921, made a total of 1,964,926 bbl. of cement, valued at \$4,633,437; the balance coming from a single plant in each of six counties.

Portland cement was first commercially produced in 1891; though in 1860 and for several years following, a natural hydraulic cement from Benicia was utilized in building operations in San Francisco. The growth of the industry became rapid after 1902; since which time cement has continued to be an important factor in the industrial life of the state. Although the total cement figures, to date, are not of the same magnitude as those for gold and petroleum, it is interesting to note that the value of California's cement yield in 1920-1921 exceeded the value of the gold output in both years.

According to reports of the U. S. Geological Survey, California ranked third as a cement producer in 1920, being surpassed by Pennsylvania with 28,365,000 bbl., and Indiana with 10,700,000 bbl. The 1921 data are not yet at hand.—*California Mining Bureau.*



**First-aid house at Newcastle, Ind., one of the many standard first aid houses**



# Looking Ahead in Magnesite Sales

By R. W. Stone

Assistant State Geologist, Harrisburg, Pa.

**An increasing market for floor and wall plaster uses, with a stationary or declining market for the dead burned form of magnesite, is predicted in this article which treats all phases of marketing the product and in a manner which suggests better marketing methods for other products taken from the earth**

**M**AGNESITE is a little known but important non-metallic mineral. As an article of commerce it is used by comparatively few industries and they may rarely see it in the raw or crude state. The mineral is a magnesium carbonate, composed largely of magnesium oxide and carbon dioxide. The oxide is used, the gas is wasted. As the gas forms nearly 50 per cent of the weight, and is easily removed by heating, the rock is burned at the mine to save expense in shipping.

Magnesite occurs in two distinct forms, amorphous and crystalline. Amorphous magnesite, the common form, is a fine-grained, compact, white or cream-colored mineral; it has conchoidal porcelaneous fracture, and is hard to scratch with a knife; it is usually found in veins or masses in serpentine. The deposits in California, Mexico, Venezuela and Greece are of this type. Crystalline magnesite resembles medium to coarse-grained marble, and occurs as replacement masses in metamorphosed limestone, dolomite or associated sediments. The principal deposits of this class are in the state of Washington, Quebec, Austria and Czechoslovakia.

Magnesite has two principal uses: as a refractory lining for metallurgical furnaces, and as a plastic material for floors and walls of buildings. It is put on the market in two forms, dead-burned and caustic calcined.

Dead-burned magnesite, or refractory calcines, is the better known and, so far, the most used. It is employed in grain form to make the bottom of open-hearth steel furnaces and as brick for lining furnaces and converters used in making steel and copper, and in rotary kilns. The consumption for these purposes may have reached its peak, because of changes in processes and the introduction of substitutes for magnesite.

Caustic calcined magnesite is used for the manufacture of oxychloride or Sorel cement. The use of magnesite cement for floors and as interior and exterior wall plaster is growing in this country and has an unlimited market to develop. Other

uses of caustic calcines are for pipe and furnace covering, molded into sinks, bowls and other sanitary fixtures, for light carbonate and other minor products.

Magnesite in the dead-burned form is used by manufacturers of refractory products, in plants east of St. Louis, and in the caustic form by manufacturers of oxychloride cement in this same region and on the Pacific Coast. Much of the dead-burned magnesite used in the eastern United States, however, is imported from Europe. Before mining in Washington came to a standstill in December, 1920, the crude magnesite was being converted into synthetic ferromagnesite at the mine, and at the peak of production in California practically all the raw stock was calcined before marketing.

The chief markets for dead-burned magnesite are the steel plants between Baltimore and Chicago and for caustic magnesite the larger cities of the eastern United States and the Pacific Coast.

The consumption of magnesite in the United States has had a wide annual range in the last ten years, but in normal times approximates 300,000 short tons stated in terms of crude material. Consumption is production plus imports, as there are no exports.

The following table, taken from "Mineral Resources of the United States," gives the domestic production and the imports converted to the equivalent in the crude form.

TABLE I. CRUDE MAGNESITE CONSUMED IN THE UNITED STATES 1911-1921 IN SHORT TONS

Year	Domestic Production	Imports	Total	Percentage of Imports To Total
1911.....	9,375	270,098	279,473	97
1912.....	10,512	268,309	278,821	96
1913.....	9,632	347,428	357,060	97
1914.....	11,293	256,988	268,281	96
1915.....	30,499	102,913	133,412	77
1916.....	154,974	93,885	248,859	38
1917.....	116,838	38,208	155,046	11
1918.....	231,605	43,530	275,135	16
1919.....	156,226	25,321	181,547	14
1920.....	303,767	63,110	366,877	17
1921.....	47,904	67,569	115,473	58

The accompanying diagram shows very clearly the small domestic production and heavy imports up to 1914, the greatly increased output in both California and Washington during the war, the precipi-

tous decline of imports when ocean shipping was restricted, and lastly, the partial recovery of imports and marked decline of domestic production since 1920.

In 1922 very little, if any, magnesite is being mined in this country for refractory purposes. The steel plants in California may be using local magnesite but the big steel centers in the Eastern States are using Austrian magnesite.

## Chemical and Physical Requirements Vary

It is customary to ship crude magnesite in bulk and in lump form. It should be free from country rock and other impurities. For calcining in shaft kilns, the rock is used in lumps, but for proper treatment in a rotary kiln it is pulverized. Manufacturers of Epsom salts and other chemicals require crude magnesite in lumps ranging from 4 to 14 in. in size because they find that lump material dissolves best in their solution tanks. Some users of crude magnesite believe that they should have white ore, but those who have studied the question find that iron in quantities which stains the ore rather deeply does not injure their products.

No very definite limits can be set for the chemical composition of caustic calcined magnesite. Magnesium oxide content ranges from 72 to 90 per cent, lime from 2 to 6 per cent, silica from 3 to 15 per cent, and ignition loss from 1 to 15 per cent. It has been found impossible to make fixed limits for maximum percentage of any impurity, for with the possible exception of active or free lime, no impurity exerts a decided effect on the oxychloride cement reaction. The value of magnesite in an oxychloride cement accordingly cannot be determined from chemical composition. The ordinary specifications for size of plastic calcined magnesite are 97 per cent through a 100-mesh screen and 75 per cent through a 200-mesh screen, although greater fineness is sometimes desirable. Color is held to be an object by some users, but if the color is not deeper than deep cream, it is doubtful whether any difference in the finished cement product can be distin-

guished when compared with a cement made from pure white magnesite. Pure white ore ordinarily commands a premium and very dark plastic calcined magnesite is usually somewhat cheaper than the white or light cream material.

Caustic calcined magnesite should not be exposed to moist atmosphere for a long time before use, for it will lose its setting quality.

As its name implies, dead-burned magnesite is inert, has no reactive property with its chloride. Its function is simply to resist heat and basic fluxes. Therefore, in theory at least, any impurities which tend to decrease its refractoriness are undesirable. Too much silica is, of course, bad.

(maximum 7.5 to 8 per cent) and low in lime (1.5 to 3 per cent). The material must have practically no loss on ignition and show no shrinkage on heating up to 3000 deg. F.

Grain magnesite to be used in open-hearth steel and copper furnaces should be nodular and not over  $\frac{5}{8}$  in. in diameter; it may, though it does not always, command a slight premium over dead-burned magnesite in lump form.

There are no market requirements regarding the allowable percentages of impurities or of moisture. The price is not influenced by size or shape of particles. A mixture of sizes ranging from approximately  $\frac{1}{2}$  in. to extremely fine particles is

behavior of the material in his solution tanks.

Plastic calcined magnesite is sampled by taking small quantities from many packages in a shipment, mixing, and making tests on the mixed sample. Chemical analysis is sometimes made, but most reliance is placed on physical tests of oxychloride cement made from the sample. Standard tests for plastic calcined magnesite should shortly be developed by a committee of the American Society for Testing Materials.

Dead-burned magnesite is sampled and analyzed by standard methods. Quality, however, is judged by appearance as well as from analyses.

### How It Is Shipped

Crude magnesite is shipped in lump form, either in box cars or open-top cars. Plastic calcined magnesite preferably is shipped in paper bags, paper-lined burlap sacks, containing 150 lb. each, and in paper-lined barrels. Some calcined magnesite is shipped from the Pacific coast in bulk in box cars to grinding plants in the Central and Eastern states. The ground magnesite is later packed in sacks of 150 lb. with or without paper lining. Dead-burned magnesite is ordinarily shipped in bulk in box cars. Water does not damage this material. If in grain form, it is sometimes or usually shipped in bags containing 200 lb.

Foreign calcined magnesite always arrived in sacks, and for some time after foreign shipments ceased, steel works continued to ask for dead-burned magnesite shipped in sacks, because so many sacksful was the customary measurement among the men using grain magnesite in furnace bottoms. The steel works, however, became reconciled to using domestic magnesite shipped in bulk.

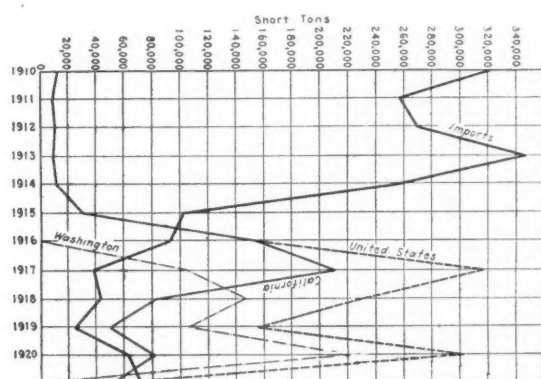
Some specify a minimum carload at 80,000 lb., and to secure the commodity rate on the railroad the material is released to a valuation of \$10 per ton. The maximum carload is 50 tons, or the limit of car capacity. For local shipments in California, cars of 30 tons may be shipped.

In general, magnesite is never insured except against loss at sea. Plastic calcined magnesite is not ordinarily assured in transit. Damage is done sometimes by a leaky car roof, but carriers promptly allow claims for such damage.

Magnesite is quoted on a fixed price per ton. Usual terms are net cash 30 days from date of invoice. Most of the plastic calcined magnesite shipped from California is sold on a sight draft basis. In some cases 30 or 45-day trade acceptances are allowed. Jobbers and local dealers sell small lots on more lenient terms, but little long-term business is handled by the producer.

### Less Than Twenty Years' Supply

The state of Washington could produce dead-burned magnesite sufficient for the steel industry, and Washington and Cali-



Magnesite production of Washington, California and the United States, and imports 1910 to 1921

But curiously, if the dead-burned calcines are entirely free from silica, or iron, or lime, they are almost useless to the trade, at least in the present technologic processes. Without these impurities they will neither frit together into grains in the calcining kiln nor will they bond together into brick. Therefore, although they all tend to reduce the refractoriness, small quantities of silica, iron and lime, perhaps 8 to 14 per cent of the total volume, are necessary to form the bond which results in the "grain" formation in the kiln. They form fusible slags and hold the refractory magnesium oxide together.

Up to the present time, Austrian magnesite has been generally accepted as the most satisfactory refractory magnesite. In crude form it carries about 4 per cent of iron and alumina sesqui-oxides, 2 to 3 per cent silica and  $\frac{1}{2}$  to  $1\frac{1}{2}$  per cent calcium oxide. As it takes about 2.2 tons of crude to make one ton of dead-burned, these percentages are doubled in the calcined product. As practically all American magnesite has a low percentage of iron, the principal producer of magnesite for refractory purposes mixed enough iron ore with the crude magnesite to bring the content of iron and alumina in the calcines up to about 7 per cent.

Dead-burned magnesite for use in the refractories trade must be low in silica

preferred to material which is either all fine or all coarse.

In both the refractories and plastic trade, little magnesite leaves the producer's plant in less than carload lots. The minimum carload is about 20 tons and there is no maximum excepting size of cars or about 50 tons. Lots smaller than carloads are handled by jobbers at consumption centers.

There are no premiums and penalties provided for in payment for purchases, nor tolerances in weighing and analysis of magnesite for refractories, although some orders specify maximums and minimums in chemical composition. Terms are usually 30 days net. When magnesite is to be used for chemical purposes, a premium or penalty for magnesium oxide content is sometimes allowed. A 1 per cent increase in magnesium oxide content over the specified limit is frequently allowed a 50-cent premium; and there may be a corresponding penalty if magnesium oxide is reduced.

### Difficulties of Crude Lump Sampling

Standard sampling methods are used and the quality is judged from analyses or tests and appearances. There are no standard tolerances. The sampling of crude lump magnesite by the buyer is decidedly difficult and it is doubtful if any is done regularly and satisfactorily. The chemical manufacturer judges quality largely by the

ifornia could supply the caustic calcines for the magnesite stucco and flooring industries, at the 1920 rate of production, for comparatively few years. That is, these states have the ore, and their mines and quarries have the capacity to meet the needs possibly for less than 20 years, if this country continued to consume magnesite as fast as in 1920 and relied wholly on the domestic supply.

Normally almost no magnesite leaves the mines in the crude condition. Marketing problems pertain, therefore, only to caustic and dead-burned magnesite. Caustic-burned magnesite has the entire United States for its market. Probably California and the Chicago district use more magnesite for stucco and flooring than other parts of the country, with the New York-Philadelphia district ranking third. Pacific coast magnesite takes care of the Western and Central states, and even secures business in New York and other Eastern cities. The Atlantic coast, however, has received calcined magnesite from Greece for many years. Importations from Greece were discontinued in 1916 but resumed in November, 1920. An American firm operating in Venezuela brought 2300 tons in the Eastern market in September, 1920, and 1100 tons in December, 1921. It is only natural, in view of the low ocean rate and high cost of transcontinental freight, that the Eastern states should buy foreign magnesite.

The market for dead-burned magnesite is a very different matter. The steel industry is the large consumer, which means that the principal market is east of the Mississippi River and north of a line through the mouth of the Ohio.

#### European Magnesite for Steel Making

Until 1917, the refractory trade had been supplied with magnesite from Austria and Hungary. Then, under necessity, magnesite from our Western states and from Canada was used. The price, of course, rose. As a result efforts were made to find a cheaper substitute and sintered dolomite was employed as a refractory lining for metallurgical furnaces. The steel industry is now using dead-burned European magnesite as it did before the war, paying about \$28 to \$30 f.o.b. cars Baltimore, Md. The plant that produced most of the domestic dead-burned ferromagnesite during the latter part of the war has been closed since December 31, 1920, presumably for lack of orders at the price asked. It is believed by some that if for any reason the price of dead-burned magnesite should be materially increased over that paid now for Austrian grade, the steel industry would discontinue the use of magnesite and substitute sintered dolomite. Of course, a sufficient reduction in price of the domestic material would put it again on the market.

Dead-burned magnesite used in the refractories trade has no special marketing problems because of the physical and chemical character of the material. It is not

injured by exposure to weather and large stocks can be held. Practically all of the dead-burned magnesite consumed in this country is sold by a few of the larger refractories companies, as the American Refractories Co., General Refractories Co., Harbison-Walker Co. and Stowe-Fuller Co.

On the other hand, plastic calcined magnesite is handled on a retail basis through building-supply agencies, and as the material deteriorates with age it cannot be stocked for long but must practically be made to order.

#### Prices and Quality

Before the war the price of Austrian crude magnesite per short ton delivered on our Atlantic seaboard was \$9 to \$10, and Grecian crude was generally valued at a little more than \$10. California crude magnesite was about \$8 a ton at the mines. The average price of European calcined magnesite was about \$16.25 a short ton, and dead-burned Austrian magnesite sold as low as \$15.75 f.o.b. docks at Philadelphia and \$15.60 f.o.b. New York.

In 1921, according to the United States Geological Survey, the average value per ton of all crude magnesite sold or treated in California was \$10.65. The price as marketed was variable and much higher. Most of the product was sold in the calcined form and the price varied with the color, whether lump or ground, whether packed in paper-lined barrels or shipped in bulk and on the size of the order.

A market report published July 8, 1922, was as follows:

Magnesite—Crude, \$8@12 per ton. High-grade caustic calcined, lump form, \$30@45 per ton. Plastic calcined, \$45@50 in barrels, carload lots, f.o.b. California points. Atlantic seaboard, \$60.

Dead-burned Austrian grains, \$30 per ton, f.o.b. Baltimore, Md.

Although crude magnesite is sold largely on a price basis, the quality enters into the sale of plastic calcines. A product which experience has shown to be uniformly of higher quality than the current average of commercial materials can usually secure a premium over such products. The current price of calcined plastic magnesite, ground and packed in bags, is between \$43 and \$47 per short ton, f.o.b. producer's plant. Packages are included and are not returnable for credit. These prices are for high-grade material of superior physical properties. Lower prices may be obtained on inferior material. Contracts of 500 to 1000 tons will take a reduction of \$1 to \$2 a ton from the above prices, depending on size of contract. California producers who have a long haul to the railroad and must shut down during the rainy seasons when roads are bad may make price concessions in order to move the maximum quantity of material just before the shut-down.

Under normal conditions there are no great fluctuations in the price of magnesite.

Dead-burned magnesite has been imported from Austria for many years, and calcined magnesite from Greece. The following table shows the quantity of magnesite imported in recent years:

TABLE II. MAGNESITE IMPORTED FOR CONSUMPTION IN THE UNITED STATES 1914-1921

Year	Crude		Calcined (not purified)	
	Tons	Value	Tons	Value
1914	13,354	\$34,677	121,816	\$1,323,194
1915	49,764	255,140	26,574	232,071
1916	75,345	634,447	9,269	204,183
1917	30,277	232,105	3,965	232,601
1918	5,432	103,233	19,049	824,022
1919	6,381	103,311	9,471	270,721
1920	33,549	406,204	14,779	373,165
1921	51,993	525,452	6,788	250,932

#### Domestic and Foreign Magnesite Compared

Probably there is no physical difference between the crude white Californian and Grecian magnesite for plastic purposes. With calcined material, however, it is presumed that California magnesite calcined in a rotary kiln with pyrometric control is better conditioned than any other plastic calcines.

There is very little difference in quality between Washington and Austrian magnesite for refractories. It has been claimed that where records have been kept in the steel and copper industries, costs of magnesite have always been lower when the Austrian was used. This may have been true when compared with Canadian magnesite or with the early domestic product, but I doubt if any appreciable difference could be recognized by an impartial observer between the quality of staying power of the dead-burned magnesite made in Washington in 1920 and the Austrian. The fact that the iron occurs naturally in the Austrian ore and was synthetic in the Washington product and therefore regulated to the proper amount is immaterial, as is also probably the slight difference in silica content.

Here, in the writer's opinion, is the situation. The market for dead-burned magnesite is not likely to increase much and may decrease. On the other hand, the market for plastic calcined magnesite can be extended tremendously. There would seem to be no limit to the demand that might be created for magnesite as a covering for exterior and interior walls and floors of buildings. A demand can be developed, however, only on a standardized and dependable article.

The domestic producer of plastic calcined magnesite has a large part of the United States as uncontested market anyway, and I believe should compete successfully in the rest of the country (the Atlantic coast) on a quality basis when the dependability of the domestic product is recognized by the consumers. This condition can be brought about by perfecting the method of calcining. When that is done and the product is thoroughly reliable, the marketing of magnesite will be easier than now.—*Engineering and Mining Journal-Press.*



# Where Production Costs Are Low

Few plants producing 400 tons of washed and graded sand and gravel a day are designed to be operated by one man. For a small plant this one is particularly compact and well designed. It not only washes and screens bank material, but it is used for reclaiming the excavated gravel from road and building foundation work

**F**URNISHING sand and gravel for construction work, Mayer Brothers Construction Co., of Erie, Pa., has a 400-ton-a-day screening and washing plant which is compact, simple in operation, low in operating cost, and effective in results.

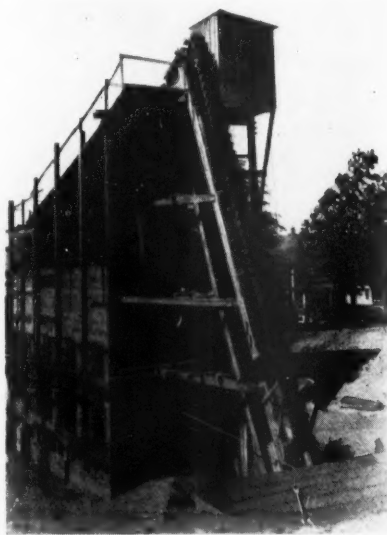
The plant is located in about the center of a bank of gravel covering 5 acres of ground, and bank run material has been carried to the bucket elevator by means of horse scrapers. Now that the bank is 50 to 75 feet away from the grating at the foot of the elevator the horse scrapers have been replaced by power apparatus, and at present the excavation work is being accomplished by steam shovel and dump wagons.

But the plant is not alone for screening and washing the bank material. Much of the excavated material in preparing road and building foundations in this section is a fairly good quality of gravel, and when it does not contain too much foreign matter this excavated material can be hauled to the washing plant, which is not more than a 1/2-mile from the center of this section of the city, cleaned, graded, and used as first quality sand and gravel.

## Making a Double Saving

A double saving results. Instead of the expense of hauling and dumping the

material as waste it is reclaimed and made into a profitable product, and the company's supply of sand and gravel is maintained without the cost of excavating from the bank.



*This compact plant is producing washed and graded sand and gravel at an unusually low cost of operation*

One of the illustrations shows a truck which has just come from a road excavation job dumping its load of gravel on the grating through which all material under 4 1/2-in. in size passes to reach the bucket elevator. This grating, as another illustration shows, is made 1 1/2 x 3/8-in. longitudinal bars on edge, with 3/4-in. round cross bars, passing through the flat bars, and the whole set flush with the ground.

Below the grating the material falls on a converging steel-lined trough set at an angle of about 45 deg. A constant stream of water at each corner of this trough aids the natural gravity action in carrying the material down to the bucket elevator which carries it to the washing and screening plant over the storage bins.

## The Screening Plant

Here a three-unit revolving screen apparatus cleans and grades the material. The first screen removes the coarse gravel, and the material passing this screen goes into the scrubber where the sand is thoroughly washed, then through the third unit where roofing gravel is removed. The fine material or sand goes into a settling tank which completes the operation of washing and separating the sand.

The elevator and screens are electrically operated.

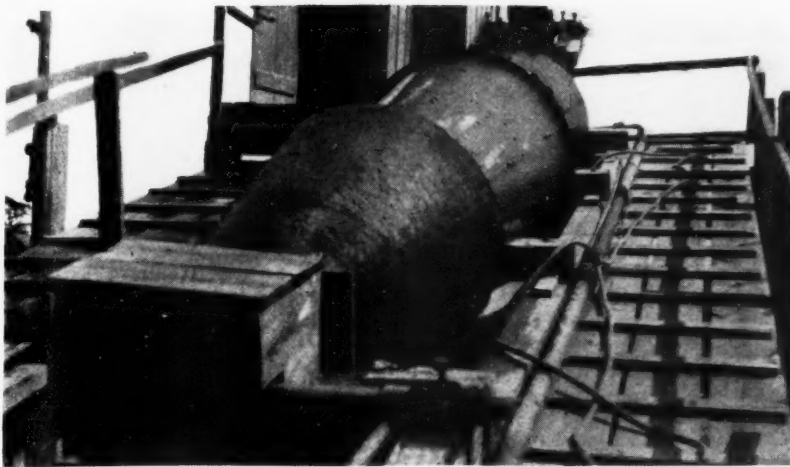


*Not only is bank material washed and screened, but gravel from road and building foundation excavation is hauled to the plant in trucks and washed, as shown here*



*On this grating set at grade is dumped all material to be fed to the elevator. Stones over 4 1/2 inches are held on the grating, while all that passes will make usable material*





*Two screens, with a scrubber between, electrically driven, effectively clean and separate the gravel. A settling tank below separates the sand*

cally driven by individual motors and one man is all that is needed at the plant to watch its operation, get the gravel through the grating, and load from storage bins into trucks from the loading spouts on the side of the bins. When gravel is being taken from the bank, additional men are of course required for the excavation and conveying work, but the compact, simple design of the plant makes it an economical one to operate.

This plant was designed and built by Jos. G. Mayer of Mayer Brothers Construction Co., and has been proclaimed the last word in efficiency for a small plant.

### **Suggests Agstone Chair at Ohio University**

IT has been suggested by Prof. Firman E. Bear, chief of the soils department, College of Agriculture, Ohio State University, that an Agstone chair and fellowship be established at that university. The National Agstone Association has been asked to consider this matter and to contribute to its expense.

### **Fire Destroys Salem Stone Plant**

FIRE totally destroyed the Salem stone mill at Bedford, Ind., on July 30 when the plant was struck by lightning. The loss is estimated at \$400,000. The walls of the 810-ft. mill shed are a mass of ruins and in the debris is a carload of molten window panes. Twelve of the steel gangs were twisted and the six new immense steel gangs, installed at a cost of more than \$20,000 and which had been in use three days only, are badly damaged. The \$75,000 power plant is a total loss.

The Salem mill has been the butt of the elements. Built in 1910, it was razed in 1911 by a tornado, but was rebuilt

immediately. Officials announce that the plant will be rebuilt. Nelson Joiner, general superintendent of the Indiana Quarries Company, brought joy to the employees when he informed them they were to report to the Hoosier mill, at Oolitic, Ind., owned by the same company, where they will be taken care of. The Hoosier mill will be worked day and night in order to fill the contracts.

### **Crushed Stone Traffic Problems Can Be Taken Up Direct**

MANY crushed stone traffic problems can be taken up direct with the chairman or the secretary of the freight associations, advises Secretary J. Gottschalk of the American Railway Association. He gives the following names of persons as the right people to address:

R. N. Collyer, chairman, Trunk Line Association, New York City; N. W. Hawkes, chairman, New England Freight Association, Boston; L. E. Chalenor, secretary, Southeastern Freight Rate Committee, Atlanta, Ga.; F. A. Leland, chairman, Southwestern Freight Committee, St. Louis, Mo.; E. B. Boys, chairman Western Trunk Line Committee, Chicago; R. H. Countiss, chairman, Trans-Continental Freight Bureau, Chicago.

### **Reduction on Limestone**

COLUMBIA, TENN.—A reduction of about 10 cents per ton on crushed limestone from the Franklin quarries was announced this morning by County Agent Abernathy, which in view of the planned record-breaking crop of crimson clover and alfalfa will prove most welcome news to the farmers. This reduction will amount to no inconsiderable sum when several carloads are used.

### **Coming Fire-Prevention Exposition**

MANUFACTURERS of fire-resistive materials and of fire-fighting and retarding apparatus, for the first time, will have the opportunity of taking part in a fire-prevention exposition to be held October 2 to 7 at the 22nd Regiment Armory, New York City, where will be shown what a vital part in the fight against the great annual fire loss is played by fire-safe materials and apparatus. The exposition originated with the Fire Prevention Committee of the National Association of Insurance Agents and has been indorsed by the National Fire Protection Association, the National Association of Credit Men, the International Association of Fire Engineers, the National Board of Fire Underwriters, etc.

It is purposed to show by means of the exposition the latest ideas in fire-safe construction and also to demonstrate to the public the proper appliances to be used in fighting and preventing fires.

### **Indiana Plants Running 100 Per Cent**

INDIANA crushed stone plants, which are running 100 per cent time, have enjoyed an unparalleled prosperity this year. These plants have not been much affected by car shortages and the large amount of stone road construction has made business particularly good.

There are a score or more crushed stone plants operating in the state and their tonnage output is larger than for any other time this year, according to F. H. Connell, secretary of the Indiana Crushed Stone Association. In addition to the heavy tonnage used for road building, the companies are supplying crushed limestone as a fertilizer.

### **Want to Sell Some High Calcium Stone?**

THERE is a market in the vicinity of Chicago for finely ground high calcium limestone in carload lots, amounting probably to at least two or three cars a week. The product must analyze 90 per cent or more calcium carbonate, and must be ground so that 90 per cent will pass a 100-mesh screen. For such a product delivered to Milwaukee, Chicago, Dixon, Ill., and Hammond, Ind., a good price can be obtained. Communications concerning this product should be addressed to the editor of Rock Products.

### **Joins National Safety Council**

AMONG the recently acquired members of the National Safety Council is the Bessemer Limestone and Cement Co., Youngstown, Ohio. P. W. Griffin is the company's safety secretary, and his address is Bessemer, Pa.

# Alumina Cement—Its Development, Use and Manufacture

This is a history of and properties of high strength, quick setting cement being produced commercially in France. The article was prepared for the "Engineering-News Record" by Henry S. Spackman, a Philadelphia consulting engineer

THIS paper gives, in digest form, definite information relative to the alumina cements now commencing to be generally used in France. These cements are differentiated from portland cements by their chemical composition and by the fact that both in mortars and concretes they develop strength at the 48-hr. period equal to or exceeding that developed by portland cement at 28 days. In addition, alumina cements show a markedly greater resistance to the attacks of sea water and water-carrying sulphates in solution.

## Early Study

Almost 20 years ago it occurred to the writer that it might be possible to produce a better and more uniform cement than portland, and possibly a cheaper one, by the mechanical admixture of the separately prepared compounds then considered its essential components. With this object in view, the writer, at first in collaboration with Dr. E. W. Lazell and subsequently with E. L. Conwell, had made and studied the various silicates, aluminates and ferrates of lime then thought to be essentially present in portland cement together with a number of possible variants of these compounds, among which were aluminates of lime in proportions corresponding to two and three molecules of alumina to one of lime.

The purpose in making these various low lime aluminates was to ascertain the minimum amount of lime necessary to make the alumina active and cause it, on being added to lime, either in the form of oxide or hydrate, to combine with it. Briefly summarized, the conclusions drawn in relation to aluminates from this investigation which covered a period of over 10 years were:

Cements resembling portland cement in their action could be made from mechanical admixtures but that these cements did not develop strengths comparable with the strengths developed by low lime calcium aluminates;

Where the lime present in the aluminates exceeded that required to form a mono-calcic aluminate, the aluminate was

usually too quick setting for practical use as a cement;

Where the lime present approximated that required to form mono-calcic aluminates they could be made either slow or quick setting by varying the hardness of burning. The lighter burned aluminates were quick setting and the harder burned, slow setting;

When the lime present was less than that required to form mono-calcic aluminate, the aluminate was slow setting;

The quick setting mono- and di-calcic aluminates could be made slow setting by the mechanical admixture of slow setting low lime aluminates;

Both the slow setting low lime aluminates and the slow setting mechanical mixtures of quick setting and slow-setting aluminates were slow setting but very quick hardening and developed strengths greatly in excess of portland cement, especially at short time periods. The 24-hour tests showed strengths exceeding those of portland cement at 28 days and that the lime content in the aluminates could be reduced as low as three molecules of alumina to one of lime without apparently affecting the cementing value of the product.

Other sesqui-oxides could be substituted for alumina and that the presence of sesqui-oxide of iron up to 10 per cent seemed beneficial;

The presence of silica in any considerable proportions tended to reduce the early strength of aluminates, probably through replacement of the alumina content to which the high early strength was attributed;

The cementing values and soundness of aluminates were apparently unaffected by wide variation in the ratio of the lime to acid acting elements provided the lime was not present in excess of that required to form mono-calcic aluminates;

These alumina cements were strongly resistant to dilute acids and unaffected by sea water. The very low lime aluminates interposed greater resistance to attack by acid solutions than the higher lime ones.

It was also found that these aluminates,

in addition, had the property of combining with hydrated lime and that their addition gave to lime mortars quick hardening properties and plasticity and that relatively small additions of these aluminates greatly increased the early strength and natural and puzzolanic cements.

## Attempts at Development

As the purpose of the research was strictly commercial, no attempt was made to obtain even relatively pure materials but on the contrary low grade bauxites that could be cheaply secured in the market were used.

The equipment of the laboratory did not permit of such research work as was subsequently carried out by Day and Sheppard, Rankin, Bates and others, consequently no attempt was made to determine the chemical compounds formed in the various aluminates produced.

During the first years of the investigation, the aluminates were produced in the laboratory either by calcination in a small kiln 12 in. in diameter and 3 ft. high, or were fused in graphite crucibles heated in a gas-fired reverberatory furnace. Subsequently aluminates were produced on a semi-commercial scale in a kiln 3 ft. in diameter and 10 ft. high. Both kilns were operated continuously. The raw material after being ground, moistened, and molded into small bricks and dried, was fed into the kiln with the fuel and the calcined material drawn from the bottom. In all, some 20 tons of slow setting, quick hardening alumina cement was manufactured.

In 1909 the Aluminate Patents Co. was formed for the commercial development of the patents granted the writer, but as his patents covering the alumina cements had been held up by interference proceedings between his application and M. Bied's, which interference was subsequently decided in the writer's favor, and as the use of alumina cements as an addition material to lime seemed the most promising of immediate financial return, no effort was made to place the low lime alumina cements on the market

nor was any description of them published at that time.

As the aluminates made from mixtures of lime and bauxite in the manner described were very expensive, there was substituted for them a high alumina slag produced by the Pennsylvania Steel Co. from the smelting of the Mayari ores of Cuba, which gave slags low in silica and having an alumina content of about 30 per cent. While this slag in itself was an inert material, it could be made by special treatment sufficiently active to combine with lime and serve as an additional material. The writer regrets that his test of the high alumina cements were confined to tensile and compression tests of the cements either neat or 1:3 sand mortar. His explanation for this omission is that the importance of concrete tests was not recognized at the time.

As a result of Bied's laboratory investigations, J. & A. Pavin Lafarge commenced about 1912 to place fused monocalcic aluminate cements on the market under the trade name of "Cement Fondu." The outbreak of the war stopped the commercial development of these cements, but their manufacture was continued for military use.

#### Corroborating Investigation

P. H. Bates of the Bureau of Standards (see *Technologic Paper 197*) has recently reported results of a very extended study of aluminates undertaken by the Bureau of Standards under his direction. This research included the microscopic determination of the compounds formed both by the calcination and hydration of the aluminates as well as physical tests of neat, mortar, and concrete specimens made from eight different lots of alumina cements of varying compositions produced by calcination in the rotary kiln.

His conclusions in general correspond with those of Bied and the writer. He found that the higher lime aluminates were quick setting, that the lower lime aluminates were slow setting, and that the hydration of the lower lime aluminates consisted in the formation of hydrocalcic aluminate and hydrous alumina. He found that the low lime aluminates gave high strength at short periods, the rapid hardening being due to the rapidity with which the aluminates hydrated and the high strengths due to the thoroughness of the hydration and the large amount of colloids formed, but that owing to the susceptibility of these colloids to moisture changes the alumina cements would not be satisfactory for use when subject to the action of water.

#### Laboratory Conclusions

The work of these three independent investigators demonstrates beyond all possible question the fact that slow setting, quick hardening cements can be pro-

duced by the calcination of mixtures of alumina and lime in which the ratio of available lime to alumina does not exceed the monocalcic proportion; that the cement so produced gives strengths, neat in cement mortars, and in concretes at the end of 24 and 48 hours as high or higher than the strengths ordinarily developed by portland cement at 7 and 28 days and that the strengths of low lime high alumina cements continue to gain up to the three-month period. So far the conclusions drawn from their work are in complete accord. Mr. Bates also states "that the methods of storage of the test pieces showed that these cements had their strengths rather materially reduced by the absorption of moisture. This was due to the large amount of colloidal products of hydration which are very susceptible to moisture changes. They would therefore not be satisfactory for use when subjected to the action of water." This action noted by Mr. Bates is not in accord with the experiences of M. Bied and the writer in their laboratory work nor with the results obtained by actual use in work in France of such cements extending through a period of over 10 years.

This difference on so vital a point is unfortunate and it is to be hoped that continuance of the tests and further analysis of the results will lead Mr. Bates to a modification of his conclusions which, however, applies only to the particular cements made by the Bureau of Standards tested under the methods employed.

#### Present Use in France

With the end of the war, high alumina cements were again placed on the French market. At present two firms are engaged in their manufacture and sale, J. & A. Pavin Lafarge and the Bureau D'Organization Economique. When the writer was last at the works of Lafarge in 1919, alumina cements were being produced in a small furnace, the coke, limestone and bauxite being fed into the furnace without preliminary fine grinding. The molten material was drawn from the furnace in the same manner as slag from an ordinary blast furnace. The iron oxides contained in the raw material, owing to the reducing action of the furnace and difference in specific gravity, partially separated out from the slag as metallic iron, but not sufficiently to affect the color. All commercial alumina cements are much darker in color than portland cement. If bauxite low in iron is used, a white cement can be produced. This company is now constructing a second plant at Moutiers, Savoie, France, where the electric furnace will be used. The alumina cement produced by the Bureau D'Organization Economique is fused in an electric furnace, hence its trade name, "Cement Electric."

#### Properties of French Cement

In a recent letter, the Bureau D'Organization Economique makes the following claims for "Cement Electric":

The cement is a mono-calcic aluminate containing a fixed quantity of silica and oxide of iron and is made by the grinding of a product produced by the fusion in an electric furnace of a predetermined mixture of silica, alumina, iron and lime. The finished product is a mono-calcic aluminate containing certain quantities of silica and oxides of iron.

The cement is slow setting and is gaged like the ordinary portland cements but is distinguished from them by the altogether special qualities that it hardens rapidly and gives high strengths at early periods and is indecomposable by selenious waters and sea water. It is used in the same manner as portland cement but hardens more rapidly.

It is no exaggeration to say that at the end of 24 hours its strength equals that of portland cement at the end of a month, therefore forms may be removed from walls after 24 hours and from girders and slabs after 48 hours. Concretes mixed 1 part cement, 1 part sand, and 3 parts gravel show compressive strengths of 7,500 lb. per square inch at the end of 3 days, 8,500 lb. at the end of 28 days and 9,000 lb. at the end of 3 months and continue to show slowly increasing strength with time. Concretes mixed in the proportions of 1 cement, 1½ sand, and 3 gravel, give strengths of 5,750 lb. at 2 days, 6,000 lb. at 7 days, 7,500 lb. at 28 days and 7,750 lb. at 3 months. Therefore, in making calculations for structures, the compression members may be figured at 2,000 lb. per square inch instead of at 700 lb. generally used for portland cement. This results in a marked diminution in the section of compression members which together with the saving in form lumber, offsets the higher price of the cement.

The writer has no recent figures covering the strengths developed by the "Cement Fondu" but from information obtained in 1919, he believes there is little or no difference in the strengths developed by the two cements.

Owing to the higher price, the use of alumina cements in France to date has been confined to work where the special qualities are more important than price, such as repairs of streets and pavements, floors of factories, urgent alterations, foundations for machinery, etc., and in work exposed to water carrying injurious solutions and to special construction of which the following are typical examples:

#### Structural Uses

In the construction of a large coal storage depot for the Compagnie du Nord it was found that the foundations must be carried through a thick layer of quicksand and sunk to about 25 ft. The



quickest and most economical method of sinking the foundation was by the use of caissons. This method was adopted, but with this novelty, the caissons which were constructed of alumina cement were also the outside foundation walls. The largest of these had exterior dimensions of about 85 ft. in length and 25 ft. in width with a height of about 25 ft. This caisson, in addition to serving as a foundation for the coal storage bins mentioned, was to be used as a room for the installation of power plant and coal handling machinery. Sinking the caisson, which was loaded with 225 tons in addition to its own weight, was started immediately after pouring. By reason of the unequal resistance of the soil during the descent, this caisson at times was very apparently deformed but never cracked or fissured and after being finally set in place there was absolutely no permanent deformation.

#### To Remodel a Five-Story Building

In another case it was desired to remodel a five-story building, the three upper floors of which were occupied as apartments and the two lower floors as offices of a bank. The work involved the removal of a maze of small rooms, the walls of which, as is customary in France, were masonry and carried the upper stories so as to form the large halls and offices of a modern bank. This reconstruction had to be done without interruption to the work of the employees in the bank in the two lower floors and without inconvenience in any way to the occupants of the three upper floors. Steel beams and columns could not be used as it would be impossible to put them in place without interfering with the occupancy of the building. Ordinary reinforced concrete was also objectionable as it would have required leaving the forms and supports in place for two or three weeks. It was, therefore, decided to use concrete of alumina cement. This was found very satisfactory as the forms and supports could be removed within 48 hours. In addition, a considerable saving in cost resulted as compared with portland cement through the use of smaller sections, a reduced quantity of form lumber and time required for the work.

#### Commercial Possibilities

As made in the laboratories of Bates and the writer, the manufacture of alumina cement differed in no way from the customary processes employed in the manufacture of portland cement and any portland cement mill could produce alumina cements from a mixture of bauxite and lime without change of machinery.

Omitting the price paid for the bauxite, the cost of manufacture, provided the aluminates did not materially reduce the production of the kiln through exces-

sive ringing up, should be no greater than for portland cement. Theoretically it should be somewhat less as, owing to the low lime content and consequent reduced loss on ignition, a less quantity of raw material would have to be handled and in addition there should be some saving in the fuel required.

#### Dry Process Not Economical

The use of the dry process, however in connection with so high priced a raw material as mixture of bauxite and lime, would not be economical owing to the dust losses and these should be minimized by the use of the wet process. It is probable that this dust loss together with the tendency to ringing up in the kilns of the lime-bauxite mix, was what induced the Bureau D'Organisation Economique to adopt the electric furnace, for in 1919 M. Bied told the writer that as a result of his discussion with him in 1917 he had repeated his experimental work and found that fusion of the alumina cement was not necessary. Therefore, in the design of the new plant he expected to use the rotary kilns.

At present cost of fuel in France there is no marked economy in the use of the electric furnace, for while the number of kilowatt hours required to fuse a ton of cement is relatively low, this economy is offset by the high consumption of electrodes the cost of which offsets any fuel economy due to the use of hydroelectric power.

The increased cost of alumina cements produced in this country over portland cement will therefore depend on the price paid for bauxite. Assuming from \$12 to \$15 a ton for bauxite delivered at the works, this increased cost would amount to from \$1.50 to \$2 per barrel which should permit of the alumina cements being manufactured and sold at about \$4.25 per bbl. f.o.b. works, exclusive of package, which price corresponds to that at which it is now being sold in France. If, however, there was substituted for the better grade bauxite suitable for chemical work, bauxites high in iron, or there was substituted for part of the bauxite high alumina slags such as those produced by the Pennsylvania Steel Co. where the alumina content ran from 28 to 32 per cent and the lime from 28 to 30 per cent, or some other waste material high in alumina, a very marked saving should be made in the costs of these cements. Furthermore, the cost of the high grade bauxites would be much lower for mills located near the deposits as the price of bauxite used was f.o.b. Philadelphia.

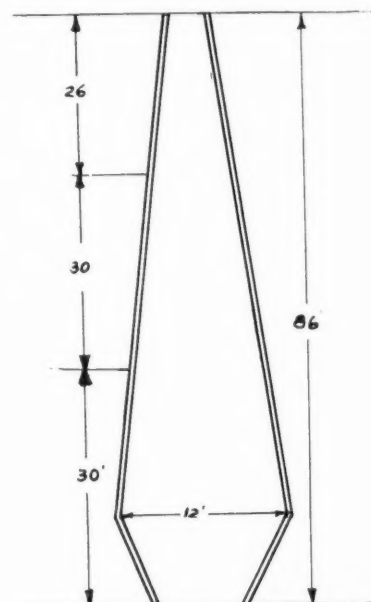
While at first thought the use of a cement costing two or three times that of portland cement would seem prohibitive, the saving in time and form lumber will to some extent offset this and

still further saving would be made, if as claimed by the French, a material reduction in section can also be made and still give a stronger structure.

#### A New Substitute for Kiln Linings

THERE has recently been put on the market by the Celite Products Co., Monadnock block, Chicago, Ill., what is said to be a new substitute for the crushed firebrick and fireclay used in lining kilns. Its trade name is Sil-O-Cel. This powder is said to represent a saving of from 60 to 70 per cent on the general run of high temperature equipment when using 4 in. of Sil-O-Cel insulation.

The accompanying illustration shows a vertical section through the standard



Vertical section of standard lime kiln providing for 4½ in. of insulating brick between refractory and shell

type of lime kiln and providing for 4½ in. of this insulating brick between the refractory and the shell. By reducing the refractory lining to 12½ in. of firebrick and using 4½ in. of this insulating brick to give the 17 in. of lining as now used, a material saving of fuel could be effected approximating twice as much as has been indicated and at the same time affording the necessary elasticity needed to provide for the expansion of the refractory, as this brick, being 80 per cent air, will take up the strain which would otherwise come upon the shell.

PRESIDENT ROOSEVELT, American Construction Council: "The construction industry is well organized. We do not need a new organization—we need co-operation between the organizations."



# What I Have Found Out About Lime

By F. C. Mathers

Indiana University, Bloomington, Ind.

This article summarizes the most important results of the researches upon lime which were made under a fellowship from the National Lime Association at Indiana University, under the author's direction. Many facts of commercial importance have been established

I HAVE always kept in mind that there is some solution for every problem. A failure simply means that the chemist has not yet found the right things to use or the correct methods to follow. Therefore, he must read more, think more, and try more experiments and continue this course until the problem is solved. I still have many problems for which I have not found solutions. However, I have solved some problems after several years of thinking, reading and experimenting. These lime problems have been interesting to me. I hope that I have found out some new and interesting things about lime.

## Settling of Milk of Lime

There are ways of slaking lime whereby the rate of settling of the hydrate is increased or decreased. A rapid settling hydrate may be made by slaking the quicklime with water containing from 0.5 to 1 per cent of calcium chloride. Other things than calcium chloride can be used, but it is probably the cheapest. A slow settling lime is made by slaking the quicklime with a 0.5 to 1 per cent sugar solution.

With lime No. 38 (high calcium) the rates of settling for hydrates prepared in various ways is as follows:

Solution used in slaking	Volume of lime after minutes given below				
	10	20	30	60	120
Pure water	86	74	63	42	29
1 per cent sugar	90	82	74	57	40
1 per cent calcium chloride	46	29	22	22	22

Other limes act in a similar way.

It is not known whether these chemical solutions will have the same action when used in slaking lime in the commercial hydrators that they had in these laboratory experiments. It seems that the results should be the same. It is thought that these chemicals in the water used for slaking have an action upon the size of the particles of hydrate. The larger particles would settle faster than the smaller ones.

Lime slaked with excess of water to a wet hydrate settles slowest of all. The presence of chemicals in the excess of water used in making a wet hydrate had little effect upon the settling.

Hydrates ground in a pebble mill settle slower than the unground hydrates.

The rapidity with which quicklime slakes

can be increased or decreased by the addition of suitable chemicals to the water. A quicklime from marble treated with an equal weight of liquids at room temperature gave the following results:

Solutions used in slaking quicklime from marble	Length of time until heat caused steam
Pure water	12 minutes
1 per cent hydrochloric acid	1 minute
5 per cent hydrochloric acid	1/2 minute
1 per cent barium chloride	20 minutes
5 per cent alcohol	30 minutes
1 per cent creosol	60 minutes
0.5 per cent sugar	180 minutes

No applications were known for these interesting reactions. This retarding action of the sugar is of some importance in sugar factories where wash solutions containing sugar are used in slaking the quicklime. They always try to have hot water to avoid delay in slaking. The Steffens method of sugar recovery from molasses must depend upon this retarding action by sugar solutions.

## Calcium Peroxide

Calcium peroxide, if it could be made cheaply by the direct heating of lime in air, as barium peroxide is made, would be a very valuable chemical. A survey of the literature shows that such a method is probably impossible commercially. This data is as follows:

Peroxide to be formed	Temperature in deg. F.	
	at which the peroxide decomposes	Temperature in deg. F. at which the peroxide may be formed by heating the oxide
Barium	1562	932
Strontium	716	720
Calcium	437	540
Magnesium	347	—

Thus it is seen that barium is the only peroxide having a temperature of formation that is lower than the temperature of decomposition. Therefore, it is necessary to use a high pressure of oxygen or air in making the strontium peroxide and a still higher pressure in making the calcium peroxide. The calcium peroxide has been made by this pressure method, but there seems to be no commercial possibility in it. No catalytic agent was found in this work which lowered the temperature of formation below the temperature of decomposition.

The present method which is generally employed is intended to measure only the

calcium hydroxide, but it may give too high a result unless the precaution suggested here is taken. In the official method the lime is partly titrated with a standard acid, is then diluted with distilled water and allowed to stand. The clear solution is then pipetted off and titrated to the final end point. Unless this solution has settled to a clear liquid, a high result will be obtained. This is likely to happen only with dolomites. The solution should be filtered before this final titration.

The available magnesium oxide may be determined by using 1 per cent ammonium chloride solution in place of pure water for the dilution described above. This dissolves one magnesium oxide that is in the free condition and is not combined with silica. No method was found for distinguishing between the magnesium hydroxide and the magnesium oxide.

## An Unusually Active Quicklime

Hydrated lime may be reburned or changed back to quicklime by heating to 840 deg. F. (450 deg. C.). The quicklime thus formed (called "reburned lime" in this paper) is very fine and is exceedingly active especially towards water. It instantly slakes with cold water and the solutions which retarded the slaking of ordinary quicklime had no apparent action on this active reburned lime. This reburned lime will instantly combine with the water in 95 per cent alcohol as shown by the quick heating, while ordinary quicklime shows no apparent reaction.

A complete investigation was made of the use of this reburned lime for dehydrating alcohol. With twice the quantity of lime required for combining with the water in the alcohol, lime No. 63, at room temperature, gave the following results:

Days of contact alcohol and lime	Per cent of alcohol with	
	Original quicklime	Reburned quicklime
At start	93.5	93.5
1 day	95.96	99.44
3 days	98.25	—
4 days	—	99.49
5 days	98.6	—
7 days	98.84	99.56
10 days	99.44	—

Thus a commercially anhydrous alcohol may be obtained in one day, whereas 10

days were required for the original quicklime to give an equally strong alcohol.

The results with lime No. 63, using 1.3 times the theoretical quantity of lime at room temperature, are as follows:

Time of contact in days	Per cent of alcohol with Original quicklime	Returned quicklime
At start	93.5	93.5
2 days	95.8	97.9
6 days	98.6	98.6
11 days	99.08	98.4
16 days	99.2	97.61

This table shows that with only a slight excess of the lime No. 63, the ordinary quicklime is superior to the returned. However, very long periods of time are required for the reaction.

With lime No. 79 heated for one hour with the alcohol the results were:

Quantity of lime in ratio to that theoretically needed to combine with the water	Per cent of alcohol using Ordinary quicklime	Returned quicklime
1.4	97.37	99.68
1.5	97.46	99.8
1.6	97.46	99.8

Thus it is seen that with 1.4 times the theoretical quantity of lime, a commercially anhydrous alcohol can be gotten in one hour. It must be remembered that this lime No. 79 seemed to be especially good for this use.

The returned limes vary in this dehydrating activity just as ordinary quicklimes vary. In all cases, however, the returned quicklimes gave quicker results than the ordinary quicklimes. It is possible to dehydrate alcohol with ordinary quicklime if the action between the lime and the alcohol is allowed to run for a longer time.

It is hoped that other uses for this active quicklime will be found.

#### Plasticity of Lime

This ever present subject was investigated for a time along other lines than the Bureau of Standards method of fine grinding. No method of making plastic lime from the high calcium limes was found. No theory is advanced to account for the phenomenon of plasticity. It is of interest to know that hydrate ground in a pebble mill as recommended by the Bureau of Standards will settle faster than the unground hydrate, which indicates that the grinding probably makes the particles denser rather than merely smaller.

No very noticeable effect upon plasticity of high calcium limes was produced by:

1. Slaking the quicklime with different chemical solutions and under different conditions of temperature.
2. Slaking in water vapor or steam (air slaking with both the quicklime and the water in a closed vessel) at various temperatures.
3. Partial slaking as above with the rest of the slaking in the ordinary way.
4. Partial carbonation followed by slaking in the ordinary way.

It was thought that the inert material, carbonate or partly slaked lime would make a skeleton in the hydrate just as the mag-

nesium oxide may do in the dolomite. All of these experiments failed to give plastic limes, but they led to the various new things which are described in this paper.

It was thought best to discontinue the plasticity experiments under the National Lime Association Fellowship, but recently more plasticity experiments have been made independently. It is very probable that the non-plastic hydrates can be made plastic at a much lower final cost than by the method described by the Bureau of Standards.

#### Fineness of Hydrates

Hydrates slaked with water, with sugar solution and with water vapor (air slaked)

have apparent densities which decrease in the order named. The results with lime No. 71 are as follows:

Slaking agent	Apparent density
Pure water	34.2
1 per cent sugar solution	30.4
Water vapor	27.0

It was thought that this variation might mean the magnesia was being hydrated, but no method was known of proving it.

This short paper is merely a summary of the most important parts of the researches. More extended papers will be prepared from which the rest of the data and tests can be obtained. It is hoped that this paper will lead to discussions which will aid further research work.

## Railroad Boosts Agstone

THE Baltimore and Ohio Railroad has become a booster for Agstone, declares *Macadam Service*. The railroad in 1917 established the Agricultural Bureau as a division of its commercial development department, a department of service to shippers and those living in the communities served. The bureau continued to function until the government operation of railroads. After the release of the railroads the bureau was re-established.

O. K. Quivey, a graduate in agriculture from Purdue University, was made chief of the bureau at the time it was organized in 1917, and after his return from military service, and upon the re-establishment of the bureau, Mr. Quivey was again put in charge of the agricultural development work over the Baltimore and Ohio system as general agricultural agent, which position he now holds. The work of this department is to guarantee to the shippers of agricultural commodities the best transportation service available, and Mr. Quivey frankly states that the interest of the Baltimore and Ohio in the farmer is a more or less selfish one, for the railroad can prosper only in direct proportion to the prosperity of the farmer, whether he be a livestock, fruit, truck, grain or general farmer.

In conducting the work Mr. Quivey welcomes the constructive suggestions of the patrons of the railroad, feeling that only by the exchange of ideas and by close co-operation between the farmers and the railroad can the problems of both be solved.

The Baltimore and Ohio recently announced that it would give two scholarships of \$100 each to that boy and girl in each state traversed by its lines who during 1922 did the most efficient work as members of the boys' and girls' clubs. These scholarships are available to the club members living in those counties traversed by the Baltimore and Ohio, and the scholarship can be used at the

State Agricultural College, or the winner has the alternative of using the premium to defray the expenses of a week's educational trip.

This railroad is also conducting more than 220 limestone demonstrations, the idea having been conceived by the railroad and put into execution in co-operation with the state agricultural colleges and the limestone manufacturers in the respective states. The railroad has not only given transportation to the material used in these demonstrations, but a careful check is being kept on each individual demonstration, relative to the kind of soil, so that the results may be interpreted intelligently.

#### Ohio to Plan Limestone Research

A CHAIR of limestone research may be established at Ohio State University, F. J. Colgan, head of the Colgan Limestone Products Co., has announced that limestone interests of the state, who are co-operating with the department of agricultural, chemistry and soils of Ohio State University in its test and treatment of soils, have plans under way for financing such a department and the proposition will be submitted to the university trustees in time for action before the fall term opens.

According to the plans outlined, the expense of the department will be defrayed by the limestone manufacturers. Railroads will haul free of charge limestone for demonstration purposes, and also will provide transportation for some student at the university who will make a special study of the limestone situation for three years, after which he is to be given a suitable degree by the university. Soil experts are said to be in favor of the proposition, declaring that the application of limestone is the only hope for Ohio farms, which are fast losing their natural supply of limestone.

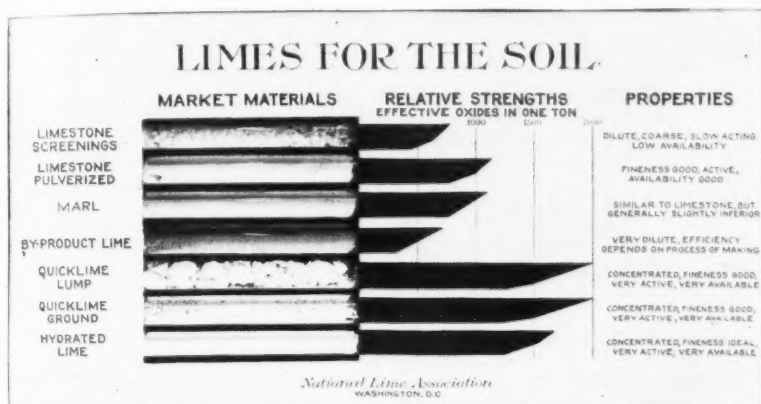
## Teaching Lime Values

**F**IGURES and percentages and relative strengths are sufficiently intelligible to the statistician or to the man who plays a great deal with figures, but when it comes to giving the user of agricultural lime a rapid and comprehensive idea of values of lime in its different forms a

in fertilizer materials and mixed goods, but in practically all lines.

The manufacturers generally are covering their requirements for fall delivery in the face of advancing prices and steady position of practically all materials, influenced by the present and anticipated demand. Ammoniates are scarce, tankage stocks are low, and there is very little

treated with rock and acid phosphates is not usually as great as is indicated by the results this year, according to L. W. Forman, who is in charge of field experiments in soils. On other soils the effects of the two materials might be quite different. He believes, however, that on most soils rock phosphate will probably be more economical than acid phosphate, where it is applied with sufficient amounts of organic matter.



Getting facts quickly understood is accomplished easily in this graphic manner where the appearance, properties, and relative strengths of agricultural lime in various forms are shown in easily-grasped manner

graphic method is much more effective.

The National Lime Association has prepared a cabinet set of soil liming materials in a manner that shows at a glance what the materials look like and what their relative values are. Seven glass tubes have been filled with seven lime products, and opposite each tube are given the name and properties, while the relative strengths in effective oxides per ton are represented by heavy black bars whose lengths are proportioned to the strengths of the product they represent.

The cabinet set, which is illustrated above, is about 10x20-in. Several hundred have already been distributed to county agents and teachers of agriculture, to whom the sets are available upon application to the National Lime Association, 918 G street, N. W., Washington, D. C.

## The Fertilizer Situation

**I**NTERVIEWS with prominent fertilizer manufacturers and materials men have developed the fact that the outlook for a satisfactory season is excellent.

The agriculturists are back to a nearly normal position—their buying power is gradually increasing. This situation makes for an increased demand for mixed fertilizers, which condition is naturally reflected throughout the industry.

From all sections come reports of a strong materials market, and business shows continued improvement, not only

offered on contracts for future delivery. Some manufacturers report that the July collections have been reasonably satisfactory at all points.

The coal and rail situation, of course, is having some influence on the market. This is particularly apparent in the sulphate of ammonia market.

The reports of sales of fertilizer in the South up to May 1st were very gratifying. These sales amounted to 3,212,653 tons, as compared with 2,758,180 tons last year, or an increase of 16.5 per cent.

Taken altogether, fertilizer manufacturers generally are very optimistic and are looking forward to a steady and sure return to normal conditions.—*American Fertilizer*.

## Iowa's Big Fertilizer Yield

**M**ANURE, lime and rock phosphate compose the fertilizer combination that has produced the largest yield of red clover in the fertilizer experiments conducted this year by the Iowa Agricultural Experiment Station at the agronomy farm at Iowa State College.

The plots which received this treatment produced 5100 lb. of hay to the acre. A treatment of manure, limestone and bone meal produced 4500 lb. to the acre and manure, lime and acid phosphate 3600 lb. The plots which received manure, lime and a 2-12-2 complete commercial fertilizer gave a yield of 3700 lb.

The spread between the yields on land

## Rail Priorities and Road Work

**I**T is still too early to predict the general effect on state-highway-construction programs of such emergency orders, growing out of the coal and the railway strikes, as the Interstate Commerce Commission may issue to cover priorities on rail shipments, says *Engineering News-Record*. In those states where road-building materials are obtained largely from local sources or where the lower types of construction, such as earth or sand-clay, are prevalent, the situation will not be serious. Elsewhere, however, a more critical condition threatens, as is indicated by the comment of state highway officials.

The reports from Texas, California, New York, Pennsylvania, Maryland and Kansas, for example, forecast a marked slowing down of road-building activities if priority orders are rigidly enforced. Few contractors have sufficient stocks of stone, cement or bituminous materials on hand to tide them over any considerable period of discontinued railway service. The coal shortage also is making itself felt at the cement mills, and unless the situation improves the Portland Cement Association believes, according to a statement issued last week, that a number of mills must soon shut down.

All of this occurs just when the road-building season is at its height. Coupled with the unusually great number of rainy days this season a crippling of rail transport service for highway materials at this time would effectively reduce the estimate of over \$700,000,000 as the probable volume of this year's highway work outside of cities.

## Sutton on Car Supply Committee

**F**EARING a repetition of the 1920 situation, when they were unable to obtain open-top cars on account of preferential rulings favoring coal shippers, the Indiana Sand and Gravel Producers' Association, at a recent meeting in Indianapolis, empowered E. Guy Sutton, Danville, Ill., former secretary of the National Association and chairman of the local car supply committee, to act with his committee in an attempt to assure a fair distribution of cars to the sand and gravel shippers.



# Hints and Helps for Superintendents

## Time and Money Savers for the Quarry Railroad

SOMETIMES a little ingenuity and a small investment will cut operating expenses to an extent that means annual savings of many times the original investment. On the other hand, the same

track leading to either shovel, as desired, and to a point nearly half way back to the shovel again.

Narrow gage tracks and equipment are used on the quarry floor and the cars are hauled to the dumping incline with locomotives, then pulled up the incline by a hoist. Loaded cars from both shov-

man unhook the hoist cable, as one of the illustrations shows, and the car continues by gravity down a more gradual incline. The momentum the car gains carries it about 100 yd. to a bumper at the elevated end of the stem of a "Y," shown in one of the other illustrations. This stops the car, and gravity reverses its direction over an automatic switch and carries it 50 yd. further toward the shovel.

There are two gravity Y's; empty cars descending the right-hand track are switched by one toward one shovel; the left-hand track leads to the other Y, and cars on this are switched toward the other shovel.

No attention is needed at the automatic switches; from the time the hoist cable is unhooked until a string of empties is ready to be picked up by a locomotive and pushed to the shovel, all the work is done by gravity. The empties are in place so that by one switching the locomotive is behind them ready to push, with the engine headed forward ready to make the complete circuit to the shovel and on back to the crusher incline.

A third illustration shows in the right foreground a train of loaded cars ready to be hauled up the dumping incline; at



*Here is the track for loaded cars from either shovel, and at either side the return tracks leading to the elevated Y's shown*

amount of ingenuity may devise a method of saving a considerable investment and attendant trouble without requiring more than a slight amount of extra labor. Whether or not it is cheaper in the end to make the investment or to go without it will depend on local conditions; each superintendent will have to calculate the respective costs of the two ways for his particular plant and see which plan seems to be best suited to his needs.

Examples of both these situations—one where a clever arrangement requiring an outlay, though a small one, for the original installation, in order to save operating expense, and one where an added plant investment was made necessary by using an original method which requires a few minutes' time of one man now and then—are found at the quarry of the Buffalo Crushed Stone Co. and at the Attica, N. Y., pit of the J. E. Carroll Sand Co. of Buffalo. Both these plans are described in the two following items.

## Switching by Gravity

AT the quarry operation two shovels are in use at two different points, and the quarry cars are switched wholly by gravity from the dumping point to the



*Two elevated Y's like this one, with automatic switches, stop the car and send it on toward the shovel where it is needed*

els approach the incline on the same central track, and near the top of the main incline are switches leading to a track on either side so that empty cars may be lowered to either return track.

When a car has been lowered by the hoist to the foot of the main incline a

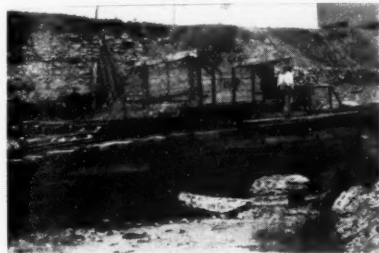
the left of these loaded cars one track leading to the left Y shown in a circle; and less distinctly at the right of the loaded cars the track leading to the right-hand Y is shown.

The plan saves the time of men and of engines in getting cars back toward the

shovels, and the cost of the extra track-age and inclined Y's is small in comparison with the savings made.

### Saving the Cost of Frogs

**A**NOTHER plan where an initial investment was saved by devising a simple method of crossing tracks is in use at the J. E. Carroll Sand Co., whose pit is



**Releasing the car for gravity to do the rest**

near Attica, N. Y. Two locomotive cranes are used for digging the sand and gravel, and to get from some parts of the pit to the coaling station, and from one end of the pit to the other, necessitates some crossing tracks. A common method of making such track intersections is to install frogs, but where one or the other tracks of the intersection has to be moved occasionally this means much trouble in moving the frogs.

In this pit no frogs are used for the

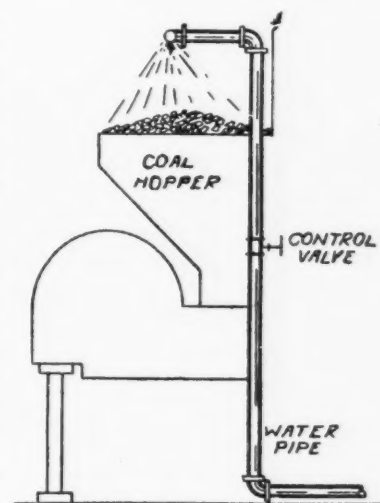
is desired to move a locomotive crane in the cross direction two pieces of rail cut to fit just inside the main rails, and in line with the cross rails, are spiked into place in a minute or two and provide a safe crossing. These inside pieces are also an inch or two above the main rails, and these elevations permit the wheel flanges to pass over the main rails without injuring them and without the wheels jumping the tracks.

Only six spikes are needed in each rail, and these can be lightly replaced in the old holes each time. The time required to lay the rails and to take them up again is not more than three or four minutes. The illustration shows a man pulling the spikes after a crane has passed over two successive crossings of this sort.

### A Good Way to Wet Down Coal

**A**NOVEL method of wetting down coal in a plant using a good grade of coal, but one that runs high in fines, is described by R. K. Long in *Power Plant Engineering*. This method consisted of wetting down the coal immediately before it went to the furnace instead of wetting it down before it went into the coal hoppers above the stoker hopper, the customary practice. A small pipe was installed along each boiler and a perforated pipe located horizontally above the stoker hopper, as shown in the accompanying illustration. A valve alongside the stoker speed control

man will attend to this matter more closely than the laborer. The operation becomes automatic. Any trouble that occurs, due to coal sticking in the chutes, becomes less likely when dry coal is used instead of wet coal. Coal is slightly corrosive when dry, perhaps; it is very corrosive when wet. Wetting the coal immediately at the stoker hopper instead of before it enters the coal-conveying ma-



**Novel method of wetting down coal**

chinery and main coal hopper means that whatever corrosion is due to wetting will occur at the stoker hopper. Corrosion will be confined to a small area and to a piece of equipment that is comparatively cheaply and very easily replaced. These advantages are worthy of consideration.

Going a little further, it might be worth while to use hot instead of cold water for wetting down. There is generally plenty of hot water going to waste. Every degree of temperature increase of the water used for wetting down means that much less heat required later to be extracted from the furnace to heat and evaporate the water. The use of hot water is thus a direct gain. Corrosion would, however, be somewhat accelerated, but not enough to offset the benefit of hot water.

### The Geophone in Mining Operations

**T**HE successful use of the geophone in military operations during the World War disclosed its possibilities in non-military ways. Aside from its use in locating buried mines, it is of great value in detecting leaks in buried water mains, in determining fires in sealed areas, and for other uses.

The Bureau of Mines has prepared technical paper No. 277 on this subject. A limited edition, free, is available to those interested.



**In a very few minutes these cross rails can be laid and taken up, making frogs and the frequent changing of frogs unnecessary**

standard gage tracks over which the locomotive cranes operate. Instead, the tracks in one direction are laid straight through, and the cross rails are cut and laid so they touch the outside of the rails and project an inch or so above the main rails. These do not interfere with traffic in the main direction, and when it

enabled the rate of water flow to be regulated.

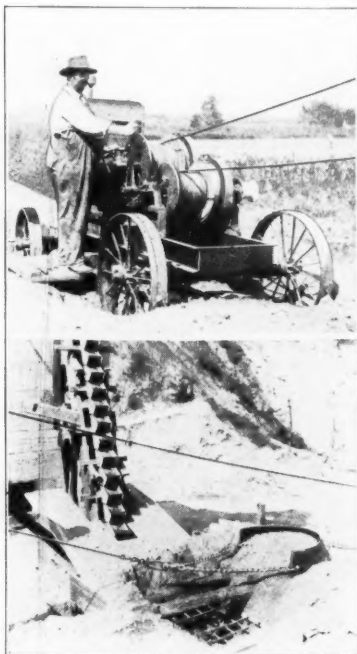
The reason that this arrangement appeals as being particularly interesting and perhaps worthy of being passed along to others is that watering the coal in this way permits close control of the water content added to the fuel; the fire-

# New Machinery and Equipment

## New Portable Drag Scraper for Small Pits

A NEW type of portable power drag scraper equipment suitable for use in small sand and gravel pits, for cut and fill work on highway construction or for storing and reclaiming loose materials has been brought out by Sauerman Brothers, 1140 Monadnock building, Chicago.

The new outfits are equipped with Crescent type power scrapers which are espe-



The top view shows the gasoline engine driven power unit of a Sauerman portable scraper outfit. The lower view shows the scraper delivering sand and gravel to the boot of the bucket elevator of a small screening plant

cially suited, claim the company, for use with a light power unit, as they are easy to pull and travel straight. The double drum hoist is furnished with gasoline engine direct connected, or is arranged for belt drive from tractor or other motive power. The truck frame is of heavy steel channel construction mounted on broad treads, grooved steel wheels with steel axles.

Any laborer on the job can operate this portable scraper outfit. One man handles the entire operation through two levers placed side by side. There is nothing for another man to do, for the scraper just

has to be dragged back and forth, loading and dumping being accomplished automatically at the will of the operator. The front drum of the hoist operates the "load" cable which leads through a sheave from the drum to the bridle chains on the front of the scraper. The "pull-back" cable leads from the rear drum through another sheave out to a guide block at the far end of the excavation, and then is attached to the rear bridle chains of the scraper.

The entire outfit can be made ready to move quickly, and in less than an hour after arriving at a new location it can be in operation. In moving from one set-up to another, simply wind the cables on the drums, disconnect the bridle cable, put the scraper and blocks on the truck, hook on the tractor, motor truck or team and pull out. At the new location sink the wheels of the power unit into the ground, connect the bridle cable to new stakes or deadmen, locate the guide blocks, haul out the cables, hook into the scraper bucket, turn over the engine, and go.

These little outfits are modest in price, says the company, yet embody the same quality features of design and construction that are found in the large Sauerman power scraper and dragline cableway excavator equipment.

## Rotary Pump Attachment for Tractor

THE Holt Mfg. Co., Peoria, Ill., is offering a rotary pump, which can be attached to the standard 5-ton tractor. The pump is compact in size and attached to the

inch. At normal speed of 1000 r.p.m. it throws a 1½-in. stream 100 ft. and requires but 26 hp., approximately two-thirds of the normal motor capacity of the 5-ton Caterpillar. This reserve capacity enables the use of a long hose, both for intake and discharge. Where an ordinary length is employed a broad area can be drenched with a heavy stream.

In general design this pump is of the rotary gear wheel type, with all working parts mounted in a heavy cast-iron case which preserves the alignment. The two main shafts are geared at the outer ends and carried in Hess-Bright anti-friction ball bearings, with gears of special alloy steel, machine cut, ground and heat-treated. The stuffing-boxes are accessible and easily repacked. A positive jaw clutch connects and disconnects the power to the pump in the same manner as the power pulley would be controlled.

The pump gears are driven through closely fitted spur gears at the extreme rear, enclosed in a tight case and run in a bath of oil. The entire driving load is taken by the spur gears, therefore none of the metal-to-metal contact comes on the pump blades. In addition to ample lubrication for the drive gears, compression grease cups are provided for the main ball bearings. While this pump is built for heavy duty service it weighs only 225 lb.

This new rotary pump has been developed through the co-operation of Holt engineers and the Goulds Mfg. Co., Seneca Falls, N. Y., has been tested under many different field conditions. It can be attached to any 5-ton tractor in the field.



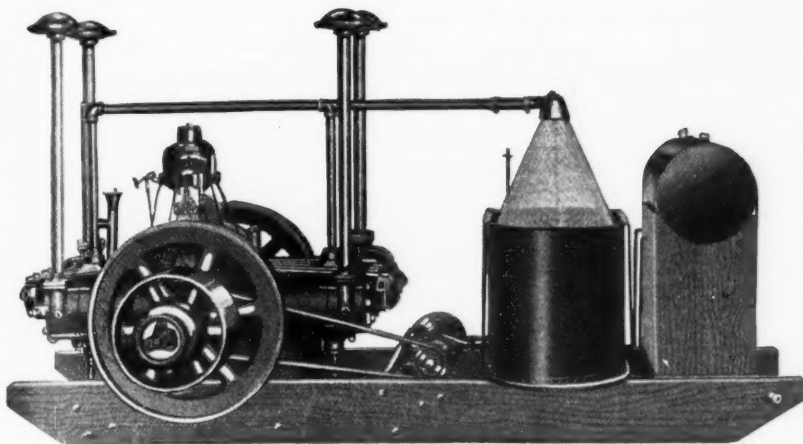
A skid motor for industrial belt work

rear of the tractor in the same position as the power pulley attachment. It is driven direct through the countershaft from the motor and can deliver 220 gal. of water per minute under 100-lb. pressure per square

## Skid Motors for Belt Work

THERE has been placed on the market by the Avery Co., Peoria, Ill., a skid motor, said to be applicable to all kinds of belt work, particularly in industrial under-





A skid motor for belt drive

takings where low first cost and economy of upkeep with continuous reliability are required. It is, says this company, simple and easy to run, requires no engineer, has no heavy boiler to move, and weighs only about 100 lb. to the horsepower.

These motors are of the two-cylinder horizontal opposed type and built in 16- and 25-hp. two-cylinder sizes and in 28, 36, 50 and 65-hp. four-cylinder sizes. Their exclusive features include renewable inner cylinder walls, centrifugal gasifiers, adjustable main crankshaft bearings, valves-in-head, removable cylinder heads, heavy crankshafts, five piston rings.

### New Maintenance Wagon

A NEW road maintenance wagon has been placed on the market by the Greenville Gravel Co., Greenville, Ohio, which is designed to withstand the severe service required from all road maintenance and similar work.

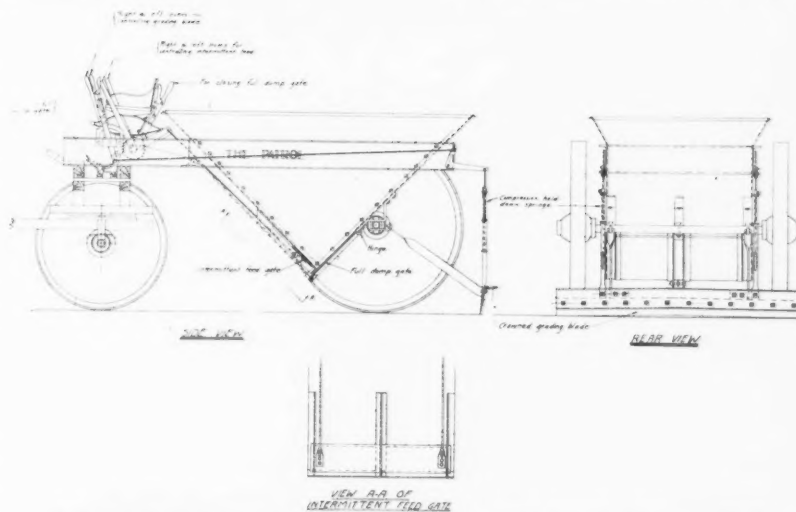


"The Patrol"—a road maintenance wagon that transports and automatically spreads the material

This wagon—called "The Patrol" because it is used by county superintendents, township trustees and others who have patrol and maintenance needs—transports and automatically spreads the material without any hand spreading and shoveling. Patents have been applied for covering this wagon.

The accompanying illustrations show a sliding gate at the lower extremity of the front slope of the wagon body and reaches across the entire width of the body; the gate is controlled at either end by rods connected to levers at either side of the driver's seat. This gate can be opened 1, 2, or more inches as desired, permitting a layer of gravel of any thickness to spread itself on the highway. The body is 42 in. wide.

A scraper blade 6 ft. long and slightly



Detailed view of road maintenance wagon showing intermittent gate feed

arched to conform to the crown of the road is attached behind; it can be lowered to further spread the material if desired. This also is controlled by levers on either side of the driver's seat and enables him to place the blade in any position, or at any slope if working at one side of the highway.

The sliding gate can be used also for filling chuck-holes in either wheel track or anywhere in the road by opening one side at a time; either side can be readily opened and closed.

Between the rear axle and the bottom point of the body on the rear sloping side a 42x16-in. hinged dumping gate, extending the full width of the box, permits the entire load being dumped at once if so desired. This dumping is accomplished by tripping a foot treadle at the driver's seat and is closed by means of a lever and ratchet similar to standard dump wagon design. This dumping gate is used when material is being hauled to a concrete mixer or in hauling trash or rubbish.

The wagon is made in 1, 1½, and 2-yd. capacities.

# Quarried from Life

By Liman Sandrock

## His Honor the Mayor

**A** LONG in the early eighties, a boy from Canada came with his folks to Bay City, Mich. It would be a telling point in our favor if we could, like Alger in his boys' tales, say that this youth was a "sturdy-framed youngster, with flashing eyes and eager manner," but it would be pure fiction on our part—we do not know. What we do know is, that Edward E. Evans, the subject of this sketch, settled in Bay City when 9 years of age, and that when he departed he was "His Honor the Mayor." Must have been a bit of "Dick Whittington Lord Mayor of Lunnon" in his makeup, eh?

Young Edward attended the public schools in Bay City and then continued his studies in a business college. Grounded in bookkeeping, he secured a position as bookkeeper with a coal and builders' supply company. Concerns of this kind seem to have cradled the majority of our successful men in the industry. Mr. Evans in due time was made general manager of this company, a fitting reward for his readiness to serve and to reach onward and upward.

Obedient the dictum of the good and true citizen that he must be active in his citizenship, Mr. Evans heeded the call of his fellows that he run for election as mayor. He was elected.

Aside from the more or less dubious honor accorded a mayor once he is elected, his job is no sinecure. He must be the angora for the irate citizen whose garbage is four minutes overtime in the alley; the Progressive Women's Circle wants a new short-skirt ordinance; the kids are sniping the birdies; the gas company has allowed the water in its stock to seep into the gas; a cop has been discovered asleep on post; his honor has failed to head the Aid for Suffering Senegambians list—you know how it is, even as a private citizen.

Notwithstanding, Mayor Evans was a real mayor of Bay City.

But the call of ambition comes to all such men, and it came to Edward Evans to seek greener fields and no longer linger beside the still waters. Therefore in 1910 he moved to Toledo and became associated with brick—a likely material in the experience of even the best regulated mayor.

Later, Mr. Evans became identified with the Whitehouse Stone Co. in that city. This company makes crushed limestone for flux, ballast, highway and concrete construction work. In 1913 he was made general manager of this company, and still holds the position.

Mr. Evans has always been an earnest student of his industry and had his worth recognized, notably in his presidency of the Ohio Macadam Association. In commercial and civic circles he figures as first vice-president of the Lucas County Bankers' Association, a director of the White-



Edward E. Evans, general manager of the Whitehouse Stone Co.

house State Savings Bank, a member of the Toledo Chamber of Commerce, and the Lions' Club.

He is also a member of the American Association of Engineers, an Elk, a 32d degree Mason and Shriner, and a K. of P.

Enjoys outdoor sports? Surely; hunting and fishing are his favorites. His chief interest in life? Let us give it to you in his own words:

"My chief interest is in my home—my one wife and our four children. To give them pleasure and happiness is my principal aim."

Speaking of the industry in general, Mr. Evans said: "The stone industry is an essential factor in our Nation's industrial life. It is a contributing element in nearly all lines of activity. In the manufacture of iron and the construction of buildings, bridges and highways it is absolutely essential. Most significant of all, our industry is as yet in the early stages of its development."

## Isostasy—Know About It?

**W**ITH no desire to upset your permanent equilibrium, we ask you: What do you know about isostasy, which is Greek for equilibrium, which is Latin for balance?

Isostasy's theory is that the oceans, continents, mountains and valleys are in perpetual balance. The geodesists and the geologists, however, are not in co-ordinacy as to said theory. Meanwhile, we'll enter into no ecstasy over isostasy; we'll get our material the same old way, undisturbed by isostasy, won't we—or will we?

## They Said It

THE RAILROADS have declared that the "strawberry season" was a success. Will the carriers ever give us a chance to say the same of our season? At present we're getting the razz-berries!

HARRY H. BRANDON of the Ohio Marble Co. donated the Agstone for the Troy fair ground racetrack recently. Agstone was first under the wire. "At last something has been found to sweeten the racing game," says *Macadam Service*.

ROCK PRODUCTS was in receipt of a list of convicted bombers, conspirators, jury bribers and perjurers mailed by the state's attorney. But at the time we were walking to work, dodging congested traffic, and scowling at the city hall as we passed. Our own personal pageant of progress was a sorry spectacle.

A. P. SANDLES: "Two genial English gentlemen were on the train with me, amazed at the size of America. One said: 'This is a hell of a country. You ride two nights and a day, and then you ain't there.'"

MACHIAS SAND AND GRAVEL CO.: "We believe that it is better to spend the profit on a car of material tracing that car by long-distance telephone than it is to dis-appoint a contractor."

AL A. ALLES, JR., of the Schaffer Engineering Co. tells this one: "Out in a certain Western hotel a man hung himself by his suspenders from a closet hook. The coroner's jury rendered this verdict: 'He met his death by coming home tight and thinking he was his pants.'"

OHIO HYDRATE AND SUPPLY CO.: "Dealers, remember that a clam eventually becomes a fossil—don't be a clam. It's so much lime; sell it as such."

## Now in the Business

**A** CERTAIN crushed stone man borrowed \$25,000 from a banker friend—and he wanted more. And he got it, this way:

"Hank, were you ever in the crushed stone business?"

"No—positively no!"

"Well, you are now!"

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## Editorial Comment

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It is not surprising that a note of impatience should creep into the utterances of those who are more and more feeling the effects of the coal strike, the rail strike, and the resulting car priorities order. The situation is one beyond their control; they are the innocent victims of a controversy that is costing both parties of the controversy much more than either is likely to get out of the final decision.

Especially does there seem to be reason for the universal complaint concerning high coal prices. Ten weeks ago a worthy attempt to control these prices and prevent a repetition of the 1920 runaway market resulted in an announcement from the Department of Commerce that Secretary Hoover had succeeded in effecting such a plan. Maximum prices for spot coal were set at \$2.20 to \$3.50 a ton in various districts, and now purchasers report that only by paying from \$4 to \$12 a ton can they secure coal to maintain operations. Conditions have changed in ten weeks, to be sure, but have they changed sufficiently to warrant the flouting of agreements which appears to exist in these cases? Or was the original announcement of fair coal prices based on a flimsy understanding coupled with a desire to make a popular appeal to the people?

Employers have a moral obligation to maintain their operations and furnish employment to those who depend on them so long as conditions permit, but with coal prices where they are today there is ample justification for saying, as many operators are saying, "We'll close down before we'll pay present coal prices."

Eleventh hour spurts are never as effective as steady, consistent plugging, yet there are situations where the old saying, "Better late than never," holds true. One of those places seems to be in the shipment of aggregates while cars are still available.

Three weeks after the coal strike started—on April 22, to be exact—ROCK PRODUCTS in these columns urged aggregate shippers to pile up stocks of material at the delivery point rather than at the production point, because the end of the strike would result in an abnormal demand for open-top cars for coal shipments. Highway officials in many states have similarly urged contractors to accumulate supplies at the job against the time when no cars would be available. The example of New Jersey is excellent in paying to contractors 80 per cent of the value of materials delivered to but not yet incorporated in the job. It furnishes an incentive to prepare for the time when material will be unobtainable because transportation is unobtainable.

There is still time in which to heed this good advice. Until the coal strike actually ends the open-top car supply will be far greater than it will be after coal shipments resume, and special efforts may make possible the shipment of added quantities of materials before such shipments cease for lack of cars.

Railroad officials are keenly aware of the situation, and they will gladly co-operate to the best of their ability in every attempt to move large quantities of aggregates before increasing coal shipments take all the cars. Only a few days may be left. The time to act is unquestionably now.

A situation has arisen—one which may arise in any prosperous aggregate year—which ought not to arise.

### Low Prices May Be Poor Business

But it has in the past, and again this year, and is likely to continue to appear until aggregate producers, big and little, realize how all are harmed in the end by such a condition.

Here is the situation. During the spring a number of producers, eager for business and for profits, and somewhat too unmindful of their ability to fulfill their obligations, accepted contracts for materials far in excess of the capacity of their operations. Some of this business—indeed much of it, perhaps—was secured wholly on a basis of price, and prices quoted were frequently below production costs.

Now these operators are being called on to fill their contracts, to deliver more materials than they are capable of producing, and their inability to meet the situation is reflecting on the industry to which they belong. Not only that, but they may in some cases be compelled to pay to their prospective customers the difference between the contract price and the price the customer has to pay at the present time to replace the missing material.

More conservative producers, those who offered their material at prices that bring fair profits, and lost contracts as a result, are being called on to supply aggregate where less scrupulous producers have failed to deliver. These men are naturally justified in filling such orders only after other orders have all been filled, and at prices which partly compensate their losses from contracts lost through the less-than-cost prices offered by others unable to fulfill their contracts.

So all parties lose—the conservative contractor, in early-season business; the radical contractor, in business at unprofitable prices; and the customer, in delays, annoyances, and possibly in the failure finally to secure his materials at prices which he might have obtained from reliable producers.



# The Rock Products Market

## Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

### Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
<b>EASTERN:</b>						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	1.25
Buffalo, N. Y.	1.00	1.25	1.10	1.10	1.10	1.25
Chaumont, N. Y.	1.00	1.25	1.10	1.10	1.10	1.25
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	1.25	1.25
Coldwater, N. Y.	1.35	1.35	1.35	1.35	1.35	1.35
Eastern Penna.	.75	1.10	1.10	1.10	1.10	1.10
Munns, N. Y.	.75	1.25	1.25	1.25	1.25	1.25
Prospect, N. Y.	.75	1.30	1.30	1.30	1.30	1.30
Walford, Pa.	1.00	1.20	1.20	1.20	1.20	1.20
Western New York	1.00	1.20	1.20	1.20	1.20	1.20
<b>CENTRAL:</b>						
Alton, Ill.	1.75	1.40	1.35	1.35	1.35	1.35
Buffalo, Iowa	.90	1.20	1.00	1.00	1.05	1.05
Chicago, Ill.	1.29	1.60	1.20	1.20	1.20	1.20
Dundas, Ont.	1.00	1.35	1.35	1.25	1.10	1.10
Faribault, Minn.	1.25	1.10	1.00	.90	.90	.90
Greencastle, Ind.	1.00	1.50	1.50	1.50	1.50	1.50
Kansas City, Mo.	1.40	1.35	1.35	1.35	1.20	1.20
Krause, Columbia and Val-	.85	.80	.80	.80	.85	.85
meyer, Ill.	.80	.80	.80	.80	.80	.80
Lannon, Wis.	.85	1.20	1.10	1.05	1.00	1.00
Mitchell, Ind.	.80	1.50	1.60	1.55	1.45	1.40
Montreal, Canada	.85	1.10	1.10	1.10	1.10	1.10
Montrose, Ia.	1.00	1.10	1.10	1.10	1.10	1.10
River Rouge, Mich.	1.10	1.10	1.10	1.10	1.10	1.10
Sheboygan, Wis.	1.35	1.25	1.25	1.25	1.10	1.10
Southern Illinois	1.30	1.35	1.35	1.35	1.35	1.35
Stolle, Ill. (I. C. R. R.)	1.30	1.40	1.30	1.25	1.25	1.35
Stone City, Iowa	.75	1.70	1.70	1.70	1.60	1.60
Toledo, Ohio	1.60	2.25	2.25	2.25	2.00	2.00
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
<b>Prices include 90c freight all sizes, .80 per ton</b>						
<b>Waukesha, Wis.</b>						
<b>SOUTHERN:</b>						
Alderson, W. Va.	1.10	1.35	1.65	1.35	1.35	1.35
Bromide, Okla.	1.50	2.00	1.40	1.25	1.25	1.25
Cartersville, Ga.	.90	1.00	1.00	1.00	.90	.90
Chickamauga, Tenn.	1.00	1.00	1.00	1.00	1.00	1.00
Dallas, Texas	1.00	1.00	1.00	1.00	1.00	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	1.00
Ft. Springs, W. Va.	1.00	1.30	1.40	1.25	1.15	1.15
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	1.45
Ladd, Ga.	2.00	2.00	2.00	1.50	1.50	1.50
Morris Spur (near Dallas) Tex.	1.00	1.25	1.25	1.25	1.25	1.00
<b>WESTERN:</b>						
Atchison, Kans.	.90	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.20	.25	1.65	1.55	1.45	1.40
Cape Girardeau, Mo.	1.50	1.50	1.50	1.50	1.25	1.25
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.40

### Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	1.50
Branford, Conn.	.60	1.50	1.25	1.15	1.00	1.00
Bound Brook, N. J.	1.80	2.30	1.90	1.50	1.40	1.40
Dresser Jct., Wis.	1.25	2.25	2.25	2.00	1.50	1.50
Duluth, Minn.	.90@1.00	2.25	1.90@2.00	1.40@1.50	1.30@1.40	1.50
E. Summit, N. J.	2.10	2.30	2.00	1.70	1.40	1.40
Eastern Mass.	.60	1.85	1.60	1.50	1.50	1.50
Eastern New York	.75	1.60	1.60	1.40	1.40	1.40
Eastern Penna.	1.25	1.70	1.60	1.50	1.40	1.40
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.35@1.45	1.15@1.25	1.05	.95@1.00	1.00
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	1.75
Richmond, Calif.	.50*	1.50*	1.50*	1.50*	1.50*	1.50*
San Diego, Calif.	.50@.70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Springfield, N. J.	1.75	2.10	1.80	1.75	1.60	1.60
Westfield, Mass.	.60	1.35	1.25	1.10	1.00	1.00

### Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Columbia, S. C.—Granite	1.00	1.50	1.50	1.50	1.25	1.20
Dundas, Ont.—Flint	.85	1.60	1.55	1.40	1.35	1.35
Eastern Penna.—Sandstone	1.20	1.35	1.20	1.20	1.30	1.30
Eastern Penna.—Quartzite	1.00	1.25	1.40	1.25	1.20	1.20
Ft. Springs, W. Va.—Granite	1.00	1.00	1.50	1.25	1.25	1.00
Lithonia, Ga.—Granite	1.35	1.40	1.30	1.15@1.40	1.20	1.20
Lohrville, Wis.—Cr. Granite	1.25@1.50	1.15@1.40	1.15@1.40	1.15@1.40	1.25@1.90	1.25@1.90
Los Angeles, Calif.—Granite	.50	2.50	2.25	2.00	1.25@1.75	1.25@1.75
Macon, Ga.—Granite	3.00@4.00	7.00@7.25	2.00@2.25	2.00@2.25	1.25@1.75	1.25@1.75
Middlebrook, Mo.—Granite	.75	1.85	1.75	1.70	1.70	1.70
Sioux Falls, S. D.—Granite	.75	1.85	1.75	1.70	1.70	1.70

\*Cubic yard. †Agrl. lime. ‡R. ballast. §Flux. †Rip-rap, a 3-inch and less.

### Agricultural Limestone

#### EASTERN:

Chaumont, N. Y.—Analysis, 95% CaCO <sub>3</sub> , 1.14% MgCO <sub>3</sub> —Thru 100 mesh; sacks, 4.00; bulk	2.50
Grove City, Pa.—Analysis, 94.89% CaCO <sub>3</sub> , 1.50% MgCO <sub>3</sub> —100% thru 20 mesh, 60% thru 100 mesh, 40% thru 200 mesh; in 80 lb. paper sacks, 4.50; bulk	3.00
Hillsville, Pa.—Analysis, 96.25% CaCO <sub>3</sub> —Raw ground; sacks, 4.50; bulk	3.00
Jamesville, N. Y.—Analysis, 89.25% CaCO <sub>3</sub> , 5.25% MgCO <sub>3</sub> ; pulverized limestone; sacks, 4.00; bulk	2.50
New Castle, Pa.—89% CaCO <sub>3</sub> , 1.4% MgCO <sub>3</sub> —75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk	3.00
Walford, Pa.—Analysis, 50% thru 100 mesh; 4.50 in paper; bulk	3.00
West Stockbridge, Mass.—Danbury, Conn., North Pownal, Vt.—Analysis, 90% CaCO <sub>3</sub> —50% thru 100 mesh; paper bags, 4.25—cloth, 4.75; bulk	3.00

#### CENTRAL:

Alton, Ill.—Analysis, 97% CaCO <sub>3</sub> , 0.1% MgCO <sub>3</sub> —90% thru 100 mesh	6.00
Bedford, Ind.—Analysis, 98.5% CaCO <sub>3</sub> , .5% MgCO <sub>3</sub> —90% thru 10 mesh	1.50
Belleville, Ont.—Analysis, 90.9% CaCO <sub>3</sub> , 1.15% MgCO <sub>3</sub> —45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk	2.50
Bellevue, Ohio—Analysis, 61.56% CaCO <sub>3</sub> , 36.24% MgCO <sub>3</sub> ; ¼ in. to dust, about 20% thru 100 mesh	1.25
Bettendorf, Ia., and Moline, Ill.—98% CaCO <sub>3</sub> , 1% MgCO <sub>3</sub> —50% thru 100 mesh; 50% thru 4 mesh	1.11
Buffalo, Ia.—90% thru 4 mesh	1.00
Cape Girardeau, Mo.—Analysis, 93% CaCO <sub>3</sub> , 3.3% MgCO <sub>3</sub> —50% thru 100 mesh	1.50
90% thru 4 mesh, cu. yd.	1.35
Chicago, Ill.—Analysis, 53.63% CaCO <sub>3</sub> , 37.51% MgCO <sub>3</sub> —90% thru 4 mesh	1.00
Columbia, Ill., near East St. Louis—¾ in. down	1.25@1.80
Detroit, Mich.—Analysis, 88% CaCO <sub>3</sub> , 7% MgCO <sub>3</sub> —75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh	1.80@3.80
Elmhurst, Ill.—Analysis, 35.73% CaCO <sub>3</sub> , 20.69% MgCO <sub>3</sub> —50% thru 50 mesh	1.25
Greencastle, Ind.—Analysis, 98% CaCO <sub>3</sub> —50% thru 50 mesh	2.00
Kansas City, Mo.—50% thru 100 mesh	1.50
Krause and Columbia, Ill.—Analysis, 90% CaCO <sub>3</sub> , 90% thru 4 mesh	1.40
Lannon, Wis.—Analysis, 54% CaCO <sub>3</sub> , 44% MgCO <sub>3</sub> —90% thru 50 mesh	2.00
Marblehead, Ohio—Analysis, 83.54% CaCO <sub>3</sub> , 14.92% MgCO <sub>3</sub> —50% thru 100 mesh; bags, 4.50; bulk	3.00
90% thru 4 mesh	1.25
Milltown, Ind.—Analysis, 94.41% CaCO <sub>3</sub> , 2.95% MgCO <sub>3</sub> —40.8% thru 100 mesh, 61.2% thru 50 mesh	1.40@1.50
Mitchell, Ind.—Analysis, 97.65% CaCO <sub>3</sub> , 1.76% MgCO <sub>3</sub> —90% thru 100 mesh	1.25
Montrose, Ia.—90% thru 100 mesh	1.25
Narbo, Ohio—Analysis, 56% CaCO <sub>3</sub> , 43% MgCO <sub>3</sub> , limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh	1.50@2.00
Ohio (different points), 20% thru 100 mesh; bulk	1.25@1.50
Piqua, O.—90% thru 100	3.25@5.00
100% thru 100	1.75@2.00
100% thru 4	1.25
River Rouge, Mich.—Analysis, 54% CaCO <sub>3</sub> , 40% MgCO <sub>3</sub> ; bulk	.80@1.40
Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ¼ in. mesh	1.30
Stone City, Ia.—Analysis, 98% CaCO <sub>3</sub> , 50% thru 50 mesh	.75

(Continued on next page)

### Agricultural Limestone

(Continued from preceding page.)

Tolado, Ohio— $\frac{1}{4}$ -in. to dust, 20% thru 100 mesh.....	1.00
Waukesha, Wis.—No. 1 kiln dried.....	2.00
No. 2 Natural.....	1.75
Chasco, Ill.—Analysis, 96.12% $\text{CaCO}_3$ , 2.5% $\text{MgCO}_3$ —90% thru 100 mesh.....	5.00
90% thru 50 mesh.....	1.35
Yellow Springs, Ohio—Analysis 96.08% $\text{CaCO}_3$ , 63% $\text{MgCO}_3$ , 32% thru 100 mesh; 95.57% sanded, 6.00; bulk.....	4.25
<b>SOUTHERN:</b>	
Alderson, W. Va.—90% thru 50 mesh	1.50
Cape Girardeau, Mo.—Analysis, 93% $\text{CaCO}_3$ , 3.5% $\text{MgCO}_3$ —50% thru 100 mesh.....	2.00
90% thru 4 mesh.....	1.50
Cartersville, Ga.—Analysis, 55% $\text{CaCO}_3$ , 42% $\text{MgCO}_3$ —all passing 10 mesh.....	2.00
Claremont, Va.—Analysis, 92% $\text{CaCO}_3$ , 2% $\text{MgCO}_3$ —90% thru 100 mesh, 4.00; 50% thru 100 mesh, 3.00; 90% thru 50 mesh, 3.00; 50% thru 50 mesh, 2.75; 90% thru 4 mesh, 2.75; 50% thru 4 mesh.....	2.75
Ft. Springs, W. Va.—Analysis, 90% $\text{CaCO}_3$ —90% thru 50 mesh.....	1.75
Hot Springs, N. C.—90% thru 100 mesh, sacks, 4.25; bulk.....	3.00
Knoxville, Tenn.—90% thru 100 mesh; bulk.....	2.70
Ladles, Ga.—90% thru 50 mesh.....	2.00
Linnville Falls, N. C.—Analysis, 53% $\text{CaCO}_3$ , 42% $\text{MgCO}_3$ —50% thru 100 mesh; 2.50 per ton bulk, 3.50 per ton mesh 200 lb. burlap; crushed limestone, $\frac{3}{4}$ down, including dust, 1.00; 1 to $\frac{3}{4}$ , 1.60; 2-in. and less.....	1.40
Mountville, Va.—Analysis, 76.60% $\text{CaCO}_3$ , 22.83% $\text{MgCO}_3$ —X thru 20 mesh; sacks.....	5.00
<b>WESTERN:</b>	
Colton, Calif.—Analysis, 95% $\text{CaCO}_3$ , 2.4% $\text{MgCO}_3$ —all thru 14 mesh—bulk	4.00
Garnett, Okla.—Analysis, 86% $\text{CaCO}_3$ , 50% thru 4 mesh.....	.50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk.....	1.80
Tulsa, Okla.—90% thru 4 mesh.....	.50

### Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

<b>GLASS SAND:</b>	
Baltimore, Md.....	2.25
Berkley Springs, W. Va.....	1.75@2.00
Cedarville and South Vineland, N. J.—Damp, 1.75; dry.....	2.25
Cheshire, Mass.—Glass sand.....	5.00@3.00
Columbus, Ohio.....	1.25
Dunbar, Pa.—Damp.....	2.00
Falls Creek, Pa.....	2.50
Hancock, Md.—Damp.....	1.25@1.75
Klondike and Pacific, Mo.....	1.75@2.50
Mapleton, Pa.....	2.00@2.25
Massillon, Ohio.....	3.00
Michigan City, Ind.—Glass sand.....	.40@.45
Mineral Ridge, O.....	2.25
Green.....	1.75
Montoursville, Pa.....	.75
Oregon, Ill.—Glass sand.....	.75
Ottawa, Ill.....	.75
Pittsburgh, Pa.—Dry, 4.00; damp.....	3.00
Rockwood, Mich.....	2.50
Round Top, Md.—Dry.....	1.25
San Francisco, Cal.....	3.00@3.50
St. Mary's, Pa.....	2.25
Thayers, Pa.....	2.00
Utica, Ill.....	1.00@1.25
Zanesville, Ohio.....	2.00@2.50

### FOUNDRY SAND:

Albany, N. Y.—Sand blast.....	4.00
Molding fine and brass molding.....	2.00
Molding coarse.....	1.75
Allentown, Pa.—Core and molding fine	1.50@1.75
Arenzville, Ill.—Molding fine.....	1.20@1.60
Beach City, O.—Core, washed and screened.....	2.00@2.50
Furnace lining.....	2.50@3.00
Molding fine and coarse.....	2.25@2.50
Cheshire, Mass.—Furnace lining, molding, fine and coarse.....	5.00
Sand blast.....	5.00@8.00
Stone sawing.....	6.00
Cleveland, O.—Molding coarse.....	1.50@2.00
Brass molding.....	1.50@2.00
Molding fine.....	1.50@2.25
Core.....	1.25@1.50
Columbus, O.—Core.....	.30@1.75
Sand blast.....	3.50@5.00
Furnace Lining.....	1.50
Molding fine.....	2.00
Molding coarse.....	1.75
Stone sawing.....	1.25
Traction.....	.75
Brass molding.....	2.00

(Continued on next page)

## Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

### Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, $\frac{1}{4}$ inch and less	Gravel, $\frac{1}{2}$ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
<b>EASTERN:</b>						
Attica, N. Y.....	.75	.75	.75	.60	.60	.60
Ambridge and So. Heights, Pa.....	1.15	1.15	1.15	1.15	.70	.70
Buffalo, N. Y.....	1.10	.95			.85	
Erie, Pa.....	1.00		1.00		1.25	
Farmingdale, N. J.....	.48	.48	1.00	1.00	1.20	
Hartford, Conn.....	.90		1.25	1.15	1.15	1.1*
Leeds Junction, Me.....		.50	1.75	1.35		1.25
Machias, N. Y.....	.95	.95	1.25	.85	.85	.85
Pittsburgh, Pa.....	1.15	1.15	1.15	1.15	.70	.70
Portland, Maine.....		.50	1.75		1.35	1.35
Washington, D. C.....	.75	.75	1.60	1.40	1.20	1.20
(re washed, river)						
<b>CENTRAL:</b>						
Alton, Ill.....		.85				.90
Anson, Wis.....	.40	.40			.70	.70
Barton, Wis.....		.60	.70	.70		
Beloit, Wis.....		.50			.50	
Chicago, Ill.....		1.75@2.23	1.75@2.43			
Cincinnati, Ohio.....	.70	.65	.90	.90	.90	.90
Columbus, Ohio.....	.75	.75@1.00	.75	.75@1.00	.75@1.00	.75
Des Moines, Ia.....	.50	.40	1.50	1.50	1.50	1.50
Detroit, Mich.....	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.....	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.....	.40@.50	.40	1.25	1.00		.90
Elkhart Lake, Wis.....	.56	.40	.66	.50	.50	.50
Ft. Dodge, Ia.....		1.22		2.17		
Grand Rapids, Mich.....		.50		.80		.70
Greenville, Mechanicsburg, O.....	.65	.65	.65	.65	.65	.65
Hamilton, Ohio.....		.50			1.60	
Hawarden, Ia.....		.60			.70	
Hersey, Mich.....		.60		1.50	.75@1.00	.75@1.00
Indianapolis, Ind.....	.60	.60			.65@.75	
Janesville, Wis.....	.65@.75	.50		.70		
Libertyville, Ill.....		.40			1.25	
Mankato, Minn.—Pit run.....	.50	.55	1.70	1.60	1.55	1.55
Mason City, Ia.....	.65	.55	1.26	1.26	1.26	
Milwaukee, Wis.....	1.06	1.06	1.25	1.25	1.25	1.25
Minneapolis, Minn.....	.35	.35	1.20	1.20	1.20	1.20
Moline, Ill.....	.60	.60	1.20	1.20	1.20	1.20
St. Louis, Mo., f.o.b. cars.....	1.10	1.30	1.50	1.30	1.35	
St. Louis, Mo., delivered on job.....	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.....	.75	.75	.75	.75	.75	.75
Terre Haute, Ind.....	.75	.75	.75	.85	.75	.75
Waukesha, Wis.....	.60		All other sizes, .70 per ton			
Winona, Minn.....	.50	.40	1.00	1.25	1.00	1.00
Yorkville, Sheridan, Moronts, Oregon, Ill.....	.60	.50@.70		.60@.80	.50@.70	.60
<b>SOUTHERN:</b>						
Alexandria, La.....		.70			1.20@1.35	
Birmingham, Ala.....	1.48			all gravel—1.88		
Charleston, W. Va.....		1.40				1.50
Estill Springs, Tenn.....	1.35	1.15		1.00	.85	.65
Ft. Worth, Tex.....		2.00		2.00		2.08
Jackson's Lake, Ala.....	.50@.60	.50@.60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.....	.75	1.00	1.50	1.50	1.50	1.50
Lake Weir, Fla.....		.60				
Macon, Ga.....		.50@.75				
Memphis, Tenn.....	1.12	1.12				1.95
N. Martinsville, W. Va.....		1.00		1.20		.80
New Orleans, La.....		.50			1.00	
Pine Bluff, Ark.....	1.20	.90				
Roseland, La.....		.25		.85	.85	
<b>WESTERN:</b>						
Grand Rapids, Wyo.....	.50	.50	.85	.85	.80	.80
Kansas City, Mo.....	(Kaw River sand, car lots, .75 per ton, Missouri River, .85)			1.50	1.50	
Los Angeles, Calif.....	1.00				1.50	
Pueblo, Colo.....	1.10*	.90*			1.50	
San Diego, Calif.....	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40
San Francisco, Calif.....		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.....	1.00*	1.00*	1.00*	1.00*		1.00*
<b>Bank Run Sand and Gravel</b>						
City or shipping point	Fine Sand, 1/10 inch down	Sand, $\frac{1}{4}$ inch	Gravel, $\frac{1}{2}$ inch	Gravel, 1 inch	Gravel, 1½ inch	Gravel, 2 inch
Boonville, N. Y.....	.60@.80		.55@.75			1.00
Cape Girardeau, Mo.....			River sand, 1.00 per yd.			
Cherokee, Iowa.....			.80 per ton—1.20 washed			
Dudley, Ky. (Crushed Sand).....	1.00	1.00		.95		
East Hartford, Conn.....			.65 per cu. yd.			.85
Estill Springs, Tenn.....						
Fishers, N. Y.....		.50@.70		.50@.60		
Hamilton, Ohio.....			.40 per cu. yd. in pit			
Hartford, Conn.....		1.00*				
Hersey, Mich.....				.50		
Indianapolis, Ind.....			Mixed gravel for concrete work, .65			.55
Lindsay, Tex.....					.65@.75	.55
Janesville, Wis.....		.65				
Pine Bluff, Ark.....			Road gravel .50		.50@.65	.50@.65
Rochester, N. Y.....	.60@.75	.60@.75				
Roseland, La.....		.75	1.30	1.30	1.30	1.30
Saginaw, Mich, f.o.b. cars.....		.75	60% gravel, 40% sand, 1.40		.50	.50
St. Louis, Mo.....	.50	.50	.50	.50		1.30
Summit Grove, Ind.....		.80		1.50		
Waco, Tex.....						
Winona, Minn.....						
York, Pa.....	.95@1.20					

### Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, $\frac{1}{4}$ inch	Gravel, $\frac{1}{2}$ inch	Gravel, 1 inch	Gravel, 1½ inch	Gravel, 2 inch
Boonville, N. Y.....	.60@.80		.55@.75			1.00
Cape Girardeau, Mo.....			River sand, 1.00 per yd.			
Cherokee, Iowa.....			.80 per ton—1.20 washed			
Dudley, Ky. (Crushed Sand).....	1.00	1.00		.95		
East Hartford, Conn.....			.65 per cu. yd.			.85
Estill Springs, Tenn.....						
Fishers, N. Y.....		.50@.70		.50@.60		
Hamilton, Ohio.....			.40 per cu. yd. in pit			
Hartford, Conn.....		1.00*				
Hersey, Mich.....				.50		
Indianapolis, Ind.....			Mixed gravel for concrete work, .65			.55
Lindsay, Tex.....					.65@.75	.55
Janesville, Wis.....		.65				
Pine Bluff, Ark.....			Road gravel .50		.50@.65	.50@.65
Rochester, N. Y.....	.60@.75	.60@.75				
Roseland, La.....		.75	1.30	1.30	1.30	1.30
Saginaw, Mich, f.o.b. cars.....		.75	60% gravel, 40% sand, 1.40		.50	.50
St. Louis, Mo.....	.50	.50	.50	.50		1.30
Summit Grove, Ind.....		.80		1.50		
Waco, Tex.....						
Winona, Minn.....						
York, Pa.....	.95@1.20					

\*Cubic yd. B Bank. L Lake. || Ballast.

## Crushed Slag

City or shipping point	Roofing	1/4 inch down	1/2 inch and less	3/4 inch and less	1 1/2 inch and less	2 1/2 inch and less	3 inch and larger
<b>EASTERN:</b>							
Buffalo, N. Y.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	2.15	2.15
Eastern Pennsylvania and Northern New Jersey	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.00	.80	1.25	.90	.90	.90	.90
Erie, Pa.	2.25	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.			1.25	1.25	1.25	1.25	1.25
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.00	1.25	1.50	1.25	1.25	1.25	1.25
<b>CENTRAL:</b>							
Chicago, Ill.			All sizes, 1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, O.	2.05		Other grades 1.45				
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.92	1.67	1.77	1.77	1.77	1.67	1.67
(Any delivery in city except team track deliveries)							
Youngstown, Dover, Hubbard, Letonia, Struthers, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Steubenville, Lowellville and Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
<b>SOUTHERN:</b>							
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Roanoke, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05

## Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Lime Blk. Bags	Lump Lime Blk. Bbl.
<b>EASTERN:</b>						
Bellefonte, Pa.			8.00	9.00	8.00	7.00
Berkley, R. I.			12.00			2.30
Buffalo, N. Y.	10.50	9.00	8.50@11.00	11.00	7.25 9.25	8.00 1.50
Chaumont, N. Y.					2.50 4.00	
Lime Ridge, Pa.						5.00
West Rutland, Vt.	13.50@14.00	11.00@11.50	11.00@11.50	13.50	10.00	11.00 3.50
West Stockbridge, Mass.						2.25
Williamsport, Pa.			10.00		10.00	6.00
York, Pa. (dealers' prices)		10.50	10.50	11.50		8.50 1.65*
Zylonite, Mass.	3.20d	2.90d	7.00			
<b>CENTRAL:</b>						
Cold Springs, Ohio	10.50	9.00	8.50		7.25 9.25	8.00
Delaware, Ohio	10.50	9.00	8.00	10.00		8.00 1.50
Gibsonburg, Ohio	10.50		8.50		7.25 9.25	8.00
Huntington, Ind.	10.50	9.00	8.50			1.70*
Luckey, Ohio	10.50	9.00	8.00			8.00
Marblehead, Ohio	10.50	9.00	8.50	11.00	7.25 9.25	8.00 1.50*
Mitchell, Ind.		11.00	11.00	11.00	9.50	8.50 1.45
Sheboygan, Wis.						7.50d
White Rock, Ohio	10.50	9.00	8.50	11.00	7.25 9.25	8.00 1.50
Woodville, O. (dlrs.' price)	10.50	9.00	8.00	10.00	7.25	8.00 1.50
<b>SOUTHERN:</b>						
Erin, Tenn.						6.00 1.00
Karo, Va.						7.00 1.30
Knoxville, Tenn.		9.50@11.00	9.50			7.50 1.30
Ocala and Zuber, Fla.	12.50			12.00		11.00 1.65
Sherwood, Tenn.	11.00	9.50			7.50	7.50
Staunton, Va.					7.00 8.00	7.50b 1.40
<b>WESTERN:</b>						
Colton, Calif.			15.00			19.70
Kirtland, N. Mex.						12.50
San Francisco, Calif.	22.00	22.00	15.00	22.00		2.15*
Tehachapi, Calif.						13.00 2.00

\*100-lb. sacks; \*180-lb. net, price per barrel; \*180-lb. net, non-returnable metal barrel; †Paper sacks.  
(a) 50-lb. paper bags; terms, 30 days net; 25¢ per ton or 5¢ per bbl. discount for cash in 10 days from date of invoice. (b) Burlap bags. (c) 200-lb. bbl. (d) 280-lb. bbl. net.

## Miscellaneous Sands

(Continued from preceding page)

Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.15
Dresden, O.—Core and traction	1.00
Molding, fine and coarse	1.25
Brass molding	1.50
Dunbar, Pa.—Traction damp	2.00
Dundee, O.—Glass, core, sand blast, traction	2.50
Molding fine, brass molding (plus 75¢ for winter loading)	2.00
Molding coarse (plus 75¢ for winter loading)	1.75
Eau Claire, Wis.—Core	1.00
Sand blast	3.25@3.75
Falls Creek, Pa.—Molding, fine and coarse	1.75
Sand blast	3.00
Traction	1.75
Franklin, Pa.—Core	1.25@1.75
Furnace lining	2.50
Molding fine	2.00
Molding coarse	1.75
Brass molding	2.00
Greenville, Ill.—Molding coarse	1.00@1.40
Joliet, Ill.—Milled, dried and screened No. 2 coarse molding sand and open hearth loam and luting clay	.60@.80
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Molding coarse and fine, stone sawing (pit run)	1.75

Klondike, Pacific and Gray Summit, Mo.—Molding fine and core	1.75@2.00
Mapleton, Pa.—Core, furnace lining, molding fine and coarse	1.75
Massillon, O.—Traction, molding fine and coarse, furnace lining, core	2.25
Michigan City, Ind.—Core, traction	.40@.45
Mineral Ridge, Ohio—(Green) core	2.25
Furnace lining, molding fine and coarse, roofing, sand blast, stone sawing and traction, brass molding	2.00
Montoursville, Pa.—Core	1.50@1.75
Traction	1.00@1.25
Molding fine	1.50
Molding coarse	1.50@2.00
New Lexington, O.—Molding fine	2.00
Molding coarse	1.75
Oregon, Ill.—Core, furnace lining, molding fine and coarse, traction	.75
Brass molding	.75
Sand blast	3.00
Ottawa, Ill.—Core, furnace lining, molding fine and coarse (crude silica sand)	.75@1.00
Ottawa, Minn.—All crude silica sand	.75@1.25
Pelzer, S. C.—Glass sand (carload lots only)	.70
Rockwood, Mich.—Core, damp	2.00
Roofing	2.50
Sand blast	3.75

## Miscellaneous Sands

(Continued)

Round Top, Md.—Glass sand	1.75@2.00
Core, furnace lining	1.45
Traction	1.60
(All per 2000 lbs.)	
San Francisco, Cal. (Washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@3.50
Direct from pit	
Furnace lining, molding coarse, sand blast	3.60
Stone sawing, traction	2.30
Thayers, Pa.—Core	1.75
Furnace lining	1.00
Molding fine and coarse	1.25
Traction	1.75
Utica, Ill.—Core	.60@1.00
Furnace lining	.50@1.00
Molding fine	.50@1.00
Roofing sand	1.00
Sand blast	2.50
Stone sawing	1.00@2.50
Traction and brass molding	1.25@2.25
Utica, Pa.—Core	
Molding fine and coarse, traction, brass molding	2.00
Warwick, O.—Core, furnace lining, molding fine and coarse (damp, 1.75) dry	2.00
Traction, brass molding (dry)	2.00
Zanesville, Ohio—Brass molding and molding fine	1.50@1.75
Molding coarse	1.25@1.50

## Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Asheville, N. C.—Ground talc (150-200 mesh), 200-lb. bags, per ton	8.00@14.00
Pencils and steel workers' crayons, per gross	1.25@2.50
Tailors' chalk, per gross	1.50
Baltimore, Md.—Crude Talc	3.50
Molding fine (20-50 mesh), bags	10.00
Cubes	50.00
Blanks, per lb.	7.00
Chatsworth, Ga.—Crude talc	12.00
Ground talc (150-200 mesh); bags	1.50@2.50
Pencil and steel workers' crayons	
Chester, Vt.—Ground talc (150-200 mesh)	7.00@9.00
Emeryville, N. Y.—200-325 mesh; bags	14.75
Glendale, Calif.—Ground talc (150-200 mesh)	16.00@30.00
(Bags extra)	
Ground talc (50-300 mesh)	13.50@15.50
200 mesh	13.50@14.50
Halesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton	2.75@3.50
Ground talc (20-50 mesh)	5.75@6.00
(150-200 mesh) bags	8.75@12.00
Johnson, Vt.—Ground talc (20-50 mesh), bulk 7.50; (150-200 mesh)	8.00@15.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@15.00
(Bags extra)	
Los Angeles, Calif.—Ground talc (200 mesh) (includ. bags)	15.00@20.00
(150-200 mesh) bags	16.00@40.00
Mertztown, Pa.—Ground talc (20-50 mesh); bulk 4.00; bags	5.00
(150-200 mesh); bulk 6.00; bags	7.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	7.50@10.00
Ground talc (150-200 mesh); bags	8.50@15.00
Waterbury, Vt.—Ground talc (20-50 mesh), bulk	7.50
(Bags 1.00 extra)	
Ground talc (150-200 mesh), bulk	9.00@14.00
(Bags 1.50 extra)	
Pencils and steel workers' crayons, per gross	1.20@2.00

Rock Phosphate  
Raw Rock

Per 2240-lb. Ton

Centerville, Tenn.—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 70%-72%	4.00@5.00
Tennessee—F. o. b. mines, long tons, unground Tenn. brown rock, 72% B. P. L.	7.00
Mt. Pleasant, Tenn.—Analysis, 70 B.P.L. (2000 lbs.)	6.50
Montpelier, Idaho—70% B.P.L.—Crude	4.75
Crushed 2-in. ring and dried	5.00
Paris, Idaho—2,000 lb. mine run, B.P.L. 70%	4.00

(Continued on next page)



## Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	\$ 9.30	\$8.40	\$8.10	\$7.80
24x14	9.30	8.40	8.10	7.80
22x12	10.80	8.70	8.40	9.10
22x11	10.80	8.70	8.40	9.10
20x12	10.80	8.70	8.40	9.10
20x10	11.70	9.00	8.70	8.40
18x10	11.70	9.00	8.70	8.40
18x 9	11.70	9.00	8.70	8.40
16x10	11.70	8.40	8.40	8.10
16x 9	11.70	8.40	8.40	8.10
16x 8	11.70	8.40	8.40	8.10
18x12	11.10	8.70	8.40	8.10
16x12	11.10	8.70	8.40	8.10
14x10	11.10	8.40	8.10	7.80
14x 8	11.10	8.40	8.10	7.80
14x 7 to 12x6	9.60	8.40	8.10	7.80
24x12	Mediums \$ 8.10	Mediums \$7.50	Mediums \$7.20	Mediums \$5.75
22x11	8.40	7.80	7.50	5.75
Other sizes	8.70	8.10	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made. Granulated slate per net ton f. o. b. quarries, Vermont and New York, 7.50.

(Continued from preceding page)

Ground Rock		Middlebrook, Mo.—Red Phillipsb'g, N. J.—Green stucco dash	
Wales, Tenn.—B.P.L. 70% Per 2000-lb. Ton	7.75		9.00@14.00
Barton, Fla.—Analysis, 50% to 65% B.P.L.	3.50@6.00	Piqua, O.—Marble	7.00@ 9.00
Centerville, Tenn.—B.P.L. 65%	6.00	Poultney, Vt.—Roofing granules	3.75
B.P.L. 75% (brown rock)	12.00	Red Granite, Wis.	7.50
Columbia, Tenn.—B.P.L. 68% to 72% B.P.L. 65% (90% thru 200 mesh) bulk	5.50	Sioux Falls, S. D.	7.50
Morrison, Fla.—Analysis, 35% B.P.L.	12.00	Tuckahoe, N. Y.	12.00
Mt. Pleasant, Tenn.—B.P.L. 70%	7.00	Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags 10c extra	5.00

Florida Soft Phosphate  
Raw Land Pebble

Per Ton	
Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Florida—F. o. b. mines, long ton, 68/66% B.P.L.	3.00
68% (min.)	3.25
70% (min.)	3.50
Jacksonville (Fla.) District	10.00@12.00

## Ground Land Pebble

Per Ton	
Jacksonville (Fla.) District	14.00
Add 2.50 for sacks	
Lakeland, Fla.—B.P.L. 60%	6.00
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	6.00@ 7.00

## Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.			
City or shipping point		Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries			17.50
Deerfield, Md.—Green; bulk	7.00		7.00
Easton, Pa.—Evergreen, creme green and royal green marble	12.00@16.00		10.00@12.00
Slate granules			7.00@8.00
Granville, N. Y.—Red slate granules			7.50
Ingomar, Ohio	12.00@25.00		12.00@25.00
Lincoln, Neb.—Red, white, grey, in bags			30.00
granite; sacks	28.50@30.00		20.00@22.50
Milwaukee, Wis.			30.00
New York, N. Y.—Red and yellow Verona			32.00

## Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	20.00	25.00@35.00
Bellows Falls, Vt.	18.00	25.00@35.00
Birmingham, Ala.	13.50	25.00@35.00
Carpenterville, N. J.	15.50	35.00
Easton, Pa.	16.00	40.00@60.00
Eugene, Ore.	25.00@26.00	50.00@75.00
Rochester, N. Y.	21.00	
Friesland, Wis.	20.00	
Houston, Tex.		19.50
Lockport, N. Y.	16.00	
Omaha, Neb.	18.00	30.00
Piqua, O.	15.00	25.00
Portland, Ore. (Del'd)	21.00	30.00@60.00
Puyallup, Wash.	18.00	30.00@75.00
Rapid City, S. D.	18.00	25.00@40.00
St. Paul, Minn.	15.00	30.00@40.00
Salem, Ore.	25.00	35.00@40.00
Salt Lake City, Utah	17.00@18.00	35.00@40.00
Seattle, Wash.	18.00@22.00	35.00@75.00
Springfield, Ill.	18.00	20.00@25.00
Tampa, Fla.	15.00	25.00@65.00
Wauwatosa, Wis.	13.00@14.50	28.00@65.00

## Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	8.50
Boston, Mass.	13.00@14.00
Brighton, N. Y.	14.75
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
El Paso, Texas	12.00
Grand Rapids, Mich.	12.50
Lancaster, N. Y.	12.75
Michigan City, Ind.	10.00
Milwaukee, Wis.	12.00@13.00

Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Redfield, Mass.	15.00
Rives Junction, Mich.	11.00
Saginaw, Mich.	11.50
San Antonio, Texas—Common	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	18.00
F. o. b. cars	16.00
Washington, D. C.	13.50
Winnipeg, Can.	17.00@25.00

## Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton	Common
Finishing		
Atlanta, Ga.	19.00	16.00
Baltimore, Md.	15.00	13.00
Boston, Mass.	23.00	20.00
Cincinnati, Ohio	19.60	14.50
Chicago, Ill.	18.00	
Dallas, Tex.	25.00	
Denver, Colo.	30.00	
Detroit, Mich.	15.25	13.25
Fort Dodge, Ia.	19.70	17.00
Grand Rapids, Mich.	15.65	
Los Angeles, Calif.	30.00	30.00
Minneapolis, Minn.	29.00	22.00
Montreal, Que.	21.00	21.00
New Orleans, La.		17.25
New York, N. Y.	16.99	
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	18.00
Seattle, Wash.	27.00	

## Lump per 180-lb. Barrel (net)

	Finishing	Common
Atlanta, Ga.	2.00	1.50
Baltimore, Md.		12.00†
Boston, Mass.	3.35	3.10
Cincinnati, Ohio		12.25
Chicago, Ill.		1.40
Denver, Colo.		2.95
Detroit, Mich.	11.50†	10.50†
Los Angeles, Calif.	3.00*	3.00*
Minneapolis, Minn.	1.70	1.40
New Orleans, La.		1.75
New York, N. Y.		70*
St. Louis, Mo.		1.90
San Francisco, Calif.		2.75
Seattle, Wash.	3.25	2.75
Sheboygan, Wis.		10.00
*280-bbl. (net). †Per ton.		

## Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga. (bags)	3.45
Boston, Mass.	2.61
Cedar Rapids, Iowa	2.33
Cincinnati, Ohio	2.39
Cleveland, Ohio	2.31
Chicago, Ill.	2.05
Dallas, Tex.	2.25
Davenport, Iowa	2.65
Denver, Colo.	2.33
Detroit, Mich.	2.14
Duluth, Minn.	2.26
Indianapolis, Ind.	2.26
Kansas City, Mo.	2.30
Los Angeles, Calif.	3.06
Milwaukee, Wis.	2.22
Minneapolis, Minn.	2.39
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.80
New York, N. Y. (includes bags)	2.40
(10c per bbl. discount in 10 days)	
Pittsburgh, Pa.	2.09
Portland, Ore.	3.05
St. Louis, Mo.	2.10
San Francisco, Calif.	2.63
St. Paul, Minn.	2.39
Toledo, Ohio	2.33
Seattle, Wash.	2.90

NOTE—Add 40c per bbl. for bags.

## Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agri-cultural Gypsum	Stucco* Calcinced Gypsum	Cement† Gauging Plaster	Wood Fiber	White‡ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board 1/2x32x36" 1500 lb. Per M Sq. Ft.	Board 3/4x32x36" 1850 lb. Per M Sq. Ft.	Wallboard 3/4x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Douglas, Ariz.			6.00	13.00		10.50@12.00				11.50@13.50			
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00		21.30	20.00	20.00		30.00
Garbutt, N. Y.			6.00	8.00	10.00	10.00		7.00				20.00	
Grand Rapids, Mich.	3.00		6.00	8.00	10.00	10.00			31.25	21.00	19.38	20.00	30.00
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Rapid City, S. D.	4.00			10.00	12.00	12.50			33.75				
Winnipeg, Man.	5.50	5.50	7.00	15.00	15.00	15.00					28.50		35.00

NOTE—Returnable Jute Bags, 15c each, \$3.00 per ton; Paper Bags, \$1.00 per ton extra.

\*Shipment in bulk 25c per ton less; †Bond plaster \$1.50 per ton additional; +Sanded Wood Fiber \$2.50 per ton additional; ‡White Moulding 50c per ton additional; ||Bulk; (a) Includes sacks.

# News of All the Industry

## Incorporations

The National Grit & Stucco Co. has been incorporated in Muscatine, Iowa, with a capital of \$50,000 by F. C. Marzolph and G. A. Alexander.

The Watertown Stone Co. has been incorporated with a capital of \$10,000 by G. P. Noble and F. W. Shepard of 401 Terrace Ave., Milwaukee, Wis.

The Mallet Sand and Supply Co., Bronx, N. Y., has been incorporated for \$20,000 by I. E. Riessick, M. K. Knorhel, E. T. Hiscox. The attorneys are Donnelly & Kadel, 280 Third Ave.

The Dorchester Cement Co., Boston, Mass., has been incorporated for \$20,000. Officers of the company are Melvin O. Battis, president; W. E. Hanson, Lakeview Ct., Wakefield, treasurer, and James J. Irwin.

The Wayne Gravel Co. has been organized at Ft. Wayne, Ind., for the purpose of buying and selling sand and gravel. The company has an initial capital stock of \$10,000 and the organizers are H. L. Carryot, F. M. Hogan and C. W. Hanna.

The Ferguson Gravel Co. has been organized in Indianapolis for the purpose of developing gravel deposits in Marion county and other parts of the state. The company has a capital stock of \$25,000 and the organizers are S. F. Ferguson, William J. Norton and Wade Donnelly.

The Utah Potash Co. has been incorporated under the laws of Delaware with a capital stock of \$8,200,000 to manufacture potash products. The plant will be in the Utah potash fields. The company was incorporated through the Corporation Trust Co. of America, Wilmington, Del.

## Dealers

The Ford City Coal and Lime Co., operating mines at Garrett's Run disposed of their holdings to the Garrett's Run Coal Co.

The H. D. Heinz Lumber Co. has engaged in the building material business in Kansas City, Mo., with a capital of \$40,000. Incorporators are H. D. Heinz, B. F. Moore and G. M. Moore.

The Empire Sand and Material Co., Wichita, Kans., which was recently incorporated for \$100,000, will add \$20,000 more to its initial capital stock so operations can be extended. The company deals in sand, cement blocks, and Shople patented cement brick. D. M. Anderson is president; A. H. Hill, vice-president, and D. B. Dudworth is secretary and treasurer.

## Sand and Gravel

Washington, Ind.—The Burruss Gravel Co. will begin operations at its plant west of Shoals. It has received a large contract for gravel and expects to be running at full capacity within a few weeks.

The Keener Ore and Gravel Co., Poplar Bluff, Mo., will develop 2300 acres near Hendrickson, Mo. G. Nunn, Cape Girardeau, Mo., is secretary and treasurer. Capacity of the plant will be 300 yd. of gravel per day.

The J. E. Carroll Sand Co., Buffalo, N. Y., plan the erection of a new washing plant located south of Buffalo near the boundary line between New York and Pennsylvania. The initial output of this new plant will be about 35 cars of sand and gravel per day and will be built so that it can be easily increased to 50 or 60 cars. The plant is expected to be in operation by April 1923.

The Los Angeles Rock and Gravel Co., Los Angeles, Calif., has purchased four acres of property at Los Angeles and plan the erection of two giant concrete storage warehouses in the pit sometime in April. The property is being improved with spur tracks and bunkers for loading cars with a 10,000 capacity and work on this

is going ahead immediately. The company has also acquired 400 acres at Baldwin Park and has ordered machinery for a complete shoveling, washing, crushing and grading equipment. The plant will have a capacity of 500 tons of finished material per day. Cost of the new bunker yards and the new plant at Baldwin Park will total \$200,000.

## Concrete Products

The American Slate & Tile Roofing Co. has been incorporated in Tulsa, Okla., by C. E. Sendeman, A. M. Alkman and L. E. Grubb.

The Concrete Pipe Co., Board of Trade building, Portland, Ore., has begun the erection of a two-story factory building to cost \$20,000.

The Gulf Concrete Pipe Co. has been incorporated in Houston, Tex., with a capital of \$20,000 by N. A. Eppes, Mrs. C. A. Sakeris and H. G. Fields.

The Colonial Concrete Products Co. has been incorporated in Baltimore, Md., with a capital of \$60,000 by Chas. L. Talbott, Geo. L. Jones and J. Russell Carroll.

The Oklahoma Cement Floor Co. has been incorporated in Oklahoma City, Okla., to manufacture concrete floors. Incorporators are C. E. Bowman, E. Hortges and A. J. Sullivan.

The Post Brothers Co., South Bend, Ind., has been incorporated for \$5000 to manufacture concrete products by C. F. Post, E. S. Post, H. F. Post, Nelly S. Post and Irene M. Post.

Joplin, Mo.—A plant for the manufacture of concrete blocks and building tile will be built in Purcell by E. B. Smith of Joplin of the Federated Mining property. Considerable machinery already is on the ground and it is expected that the plant will be in operation soon.

## Lime

Hagerstown, Md.—The plant of the Security Cement and Lime Co., will be enlarged at once, the capacity being increased 50 per cent.

The F. A. Jones Stone and Lime Co., Martinsburg, W. Va., has been incorporated for \$50,000 by F. A. Jones, Zanesville, O., and J. R. Foster, Cleveland, O.

Pine Bluff, Ark.—The Fischer Lime and Cement Co., Memphis and Little Rock, announce that a distributing warehouse for the company will soon be established here.

The Southern States Lime Corp., Charleston, S. C., will install hydrator, air separator, etc., in its plant at Crab Orchard, Tenn. Newton D. Walker is general manager.

The Duncansville Lime and Limestone Co., Johnstown, Pa., has opened a new section of its quarry property in anticipation of the demand for crushed limestone for building and other purposes.

## Manufacturers

The Scheid Engineering Corp., 90 West street New York City has been appointed metropolitan and export representative for the Franklin Moore Co., Winsted, Conn., manufacturers of material-handling machinery for industrial plants.

Arthur Whitcraft, manager of manganese steel sales of the Hadfield-Penfield Steel Co., Bucyrus, Ohio, in addition to his previous duties has also been placed in charge of all foundry operations at the South Works at Bucyrus, Ohio. The rapidly expanding volume of orders for this company's steel has made it necessary to increase production and Mr. Whitcraft has already effected an appreciable relief from the congestion which has been interfering with the meeting of delivery promises.

## Quarries

The Southwest Granite Co. has been incorporated in Austin, Texas, with a capital of \$40,000 by W. Wagner, A. Nagel and W. W. Winkler.

The Reidsville Granite Co., Reidsville, N. C., has been incorporated for \$100,000 by J. D. Bacon, R. H. Wheeler and H. C. Perkins, all of High Point, N. C.

The Continental Asphalt and Petroleum Co., Oklahoma City, Okla., plan the installation of a crusher and rollers near Sulphur. The company will develop deposits there of rock asphalt that is adaptable to surfacing of pavement with what is known as the cold-roll.

Jersey Shore, Pa.—Application for charter has been made by the Pine Creek Lime and Stone Co., to be incorporated for \$50,000. The company owns 35 acres of limestone. Crushers, trucks, etc., have been purchased. Incorporators are H. J. Carpenter, W. N. Shuman, G. H. Rorabaugh, C. E. Peterson and A. R. Gilmore.

Marr & Gordon, Inc., Barre, Vt., have purchased the granite manufacturing plant of the Presbrey-Leland Co., who will erect a new plant at Brattleboro, near its quarry at West Dummerston. The former concern will occupy its new purchase September 15 after installing new equipment. This addition to its plant makes it the largest in the Barre district.

## Trade Literature

Optical Pyrometers—The Scientific Materials Co., has issued a booklet giving technical data on the F. and F. pyrometer, its practical uses in the industries, its simplicity, design, and application. It has a direct application to the rock products industry. The theory of this instrument is also explained and illustrated.

Shovels—Bulletin C-201 of the Bucyrus Co., South Milwaukee, Wis., describes the company's 20-B Bullseye shovel, giving its exclusive and outstanding features, beginning at the boom end of the shovel. Included in these features are the two-part hoist, the all steel box type boom, outside dipper sticks, double hinged latch lever, horizontal main engine swing machinery mounted in front, removable propelling shaft, etc.

Two new catalogs of products used a great deal by rock products producers have been issued by the Dodge Sales and Engineering Co., of Mishawaka, Ind. One of these is entitled "Dodge Gearing" and contains 120 pages of valuable information on all types of gears, and the other is on "Standardized Elevators and Conveyors and Industrial Chains," and has more than 150 pages of illustrations, tables, and instructive reading matter. This company now has a complete line of conveying and transmission machinery.

Power Hose—In its book 444 the Link-Belt Co., Chicago, describes its improved drag scraper, the power hoe. Twenty years ago this company was installing the drag scraper, and while the hoe is not a substitute for all other types of elevating, conveying, unloading, reloading, scraping, storing and reclaiming equipment, the company points out that it is in a position to give its correct application, keeping in mind that each type has certain conditions to which it is best adapted. This 24-page booklet contains descriptions and illustrations showing the many applications of the power hoe.

Engineers' Handbook—This is a flexible leather book of 442 pages, blind stamped and embossed in gold—no expense having been spared to make it attractive and durable. So much for the "holder." The Union Steam Pump Co., Battle Creek, Mich., its progenitor, has prepared all this authentic information on the proper selection, installation and operation of pumping machinery, air compressors, and condensers—information which is the constant search of engineers, architects and those interested in either the theory or the practical application of this class of machinery. This is a book that will be of great assistance to all having to do with pumping machinery, air compressors and condensers.

## NON-METALLIC MINERALS

### *By-Products—*

Many large industries have a profitable existence today on products that, in reality, are by-products, rightfully belonging to other industries which have lacked the foresight or research facilities to widen their scope of operations.

Not every by-product conceived or ascertained by research, can be made profitable; but this single point should not obscure vision to the extent that valuable and recoverable by-products be left untouched with no attempt toward reclamation and marketing.

There are no industries in which feeble attempts toward the recovery and utilization of valuable by-products are more ineffectual, than the general field covered by the non-metallic mineral industry.

We invite investigations of our methods and facilities which enable us to render services along just these lines, as well as many others involving general engineering, direction of engineering, and research applying to the non-metallic mineral industry.

**Analysis—Investigation of Deposits—Plant Design—  
By-Products Recovery—General Engineering Counsel**

**WALLER CROW, INC.**  
*Engineers*

COUNSELLORS IN INDUSTRIAL  
OPERATION & FINANCE

327 S. LA SALLE STREET • CHICAGO



# Used Equipment

Rates for advertising in the Used Equipment Department: \$2.50 per column inch per insertion. Minimum charge, \$2.50. Please send check with your order. These ads must be paid in advance of insertion.

## FOR SALE

No. 2 Allis-Chalmers Gates Gyrratory Crusher.  
No. 3 Austin Gyrratory Crusher.  
No. 6 Austin Gyrratory Crusher.  
Two American Process type 24x48" Rotary Dryers.  
50' continuous steel bucket (8"x16") and chain elevator.  
50' continuous bucket (7"x13") and belt elevator.  
25 H.P. simple side crank Heilman steam engine.  
125 H.P. 18"x24" side crank Atlas steam engine.  
75 H.P. 13"x16" side crank Erie City steam engine.  
Lidgerwood Standard double cylinder, two drum, 10"x12" hoisting or cableway engine.  
Two 150 H.P. General Electric Co. Induction motors, voltage 440 or 220, shop numbers 625140 and 1164925.  
Williams No. 9 Swing hammer, Universal type pulverizer.  
Worthington 10" intake by 8" discharge by 20 cylinders steam pump.  
25 tons of 40 to 60 lb. rails.  
7-2 yard, all steel, 48" gauge end dump quarry cars.  
One Sanderson cyclone No. 14 electric, non-traction well drill and equipment.

### ADDRESS

E. W. Cooper, Engineer  
174 3rd Ave. No., Nashville, Tenn.

## Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25', 3½x25', 4x30', 5½x50', 6x60' and 7x60'; double shell dryers, 4x20', 5x30' and 6x35'; steam-heated air rotary dryers, 4x30' and 6x30'.  
KILNS—Rotary kilns, 4x40', 5x50' and 6x70', 6x100', 7x80' and 8x110'.  
MILLS—6x8', 6x5', 5x4', 3x3½' pebble and ball mills; 3' March mill; 42", 33" and 24" Fuller-Lehigh mills; 4½x20", 5x11", 5x20", 5½x22" and 6x20" tube mills; 7½x13", 9x15", 16x10" and 12x26" jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24", 36" and 40" cage mills; 3' and 4½", 6' and 8' Hardinge mills; 18x12", 20x12" and 30x10" roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Tel-smith breaker; one 36" Sturtevant emery mill; one 3 roll Griffin mill; 60" chaser mill.  
SPECIALS—Five automatic package weighing machines; jigs; 6x8', 6x5' and 4x3' Newaygo vibrating screens; Richardson automatic scales; 8' and 10' Emerick air separators.  
Air compressors.

W. P. Heineken, Engineer

95 Liberty Street, New York. Tel. Cortland 1841

- 1—59-ton standard gauge Baldwin 6-wheel saddle tank switcher.
- 1—40-ton American 4-wheel saddle tank switcher.
- 2—50-ton standard gauge Brooks 6-wheel switchers.
- 1—42-ton standard gauge Shay geared locomotive.
- 2—18-ton 36" gauge 4-wheel saddle tanks.
- 2—23-ton new 36" gauge Porter 6-wheelers, with tenders.
- 1—20-ton Industrial Loco. Crane.
- 1—14-B Bucyrus steam shovel, mounted on traction wheels.

## BIRMINGHAM RAIL & LOCOMOTIVE CO.

Birmingham, Ala.

## FOR SALE

- 2—8x110' Rotary Kilns.
- 6—5x6x7x110' Rotary Kilns.
- 1—6x16' Tube Mill, Silax Lined.
- 9—5x21' Tube Mills, Steel Lining.
- 6—250 H.P. Oil City Water Tube Boilers.
- 1—4' 6"x40' Coal Dryer.
- 1—5'x46' 6" Rock Dryer.

50 Acres of Land and Five Buildings. Stone and Steel Construction.  
Located at Stockertown, Pa.

ENGINEERING SALES COMPANY, Nashville, Tenn.  
OLLIE LAWRENCE, Stockertown, Pa.

- 1—No. 5 Gates Crusher.
- 8—Krupp Ball Mills.
- 8—33" Fuller Mills.

Shafting, Pulleys, Bearings, and Elevator Equipment, all in first-class operating condition.

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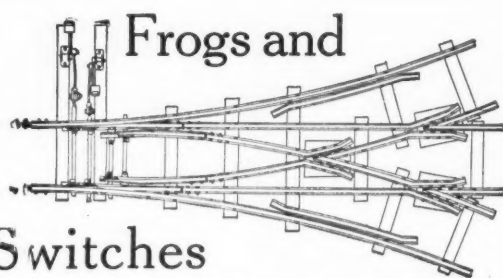
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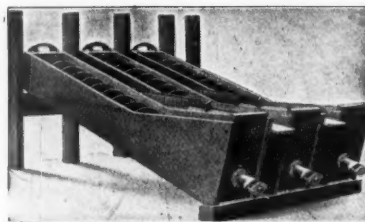
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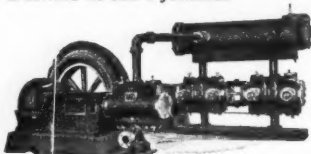
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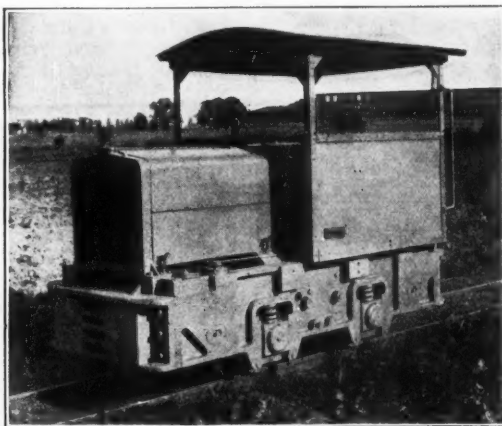
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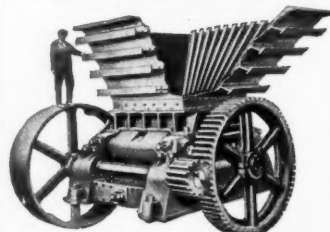
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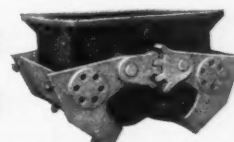
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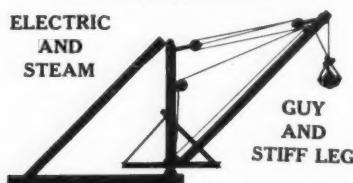
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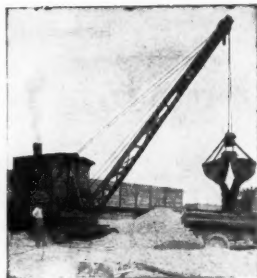
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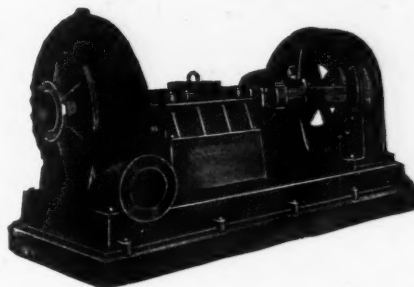
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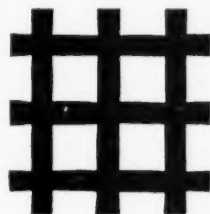
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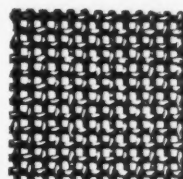
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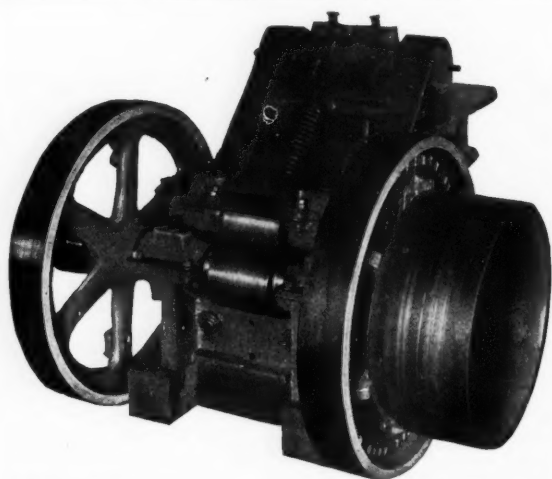
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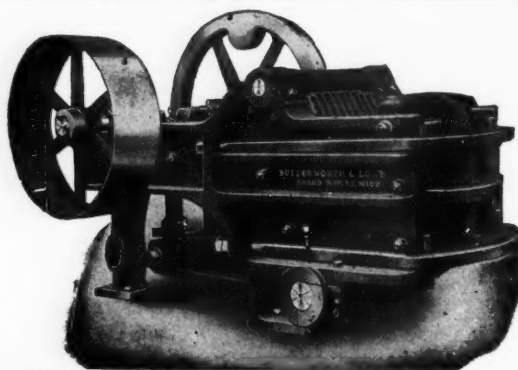
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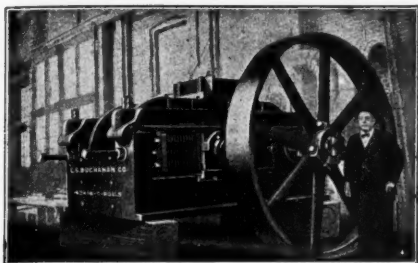
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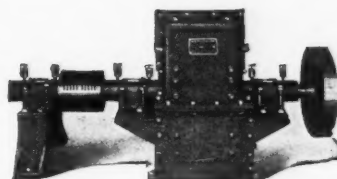
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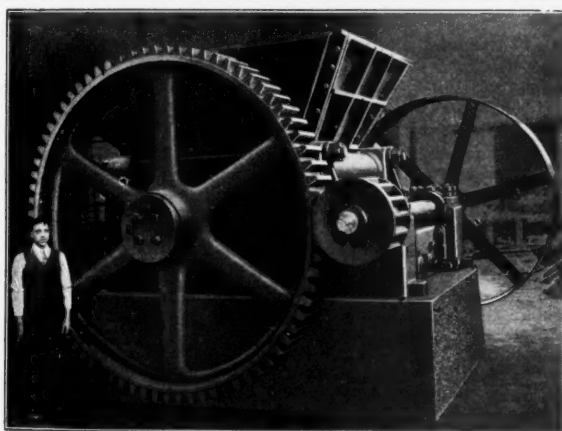
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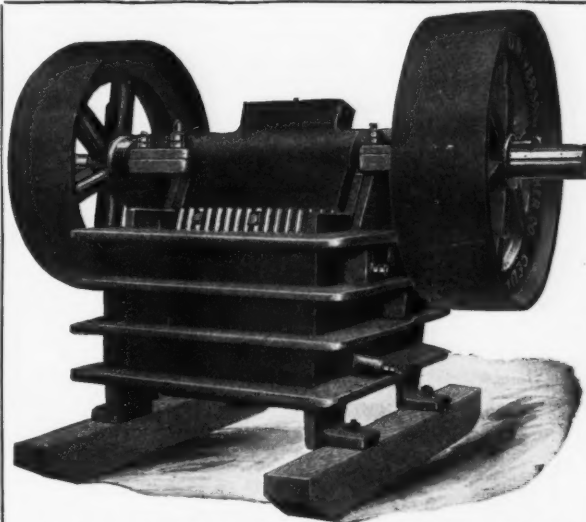
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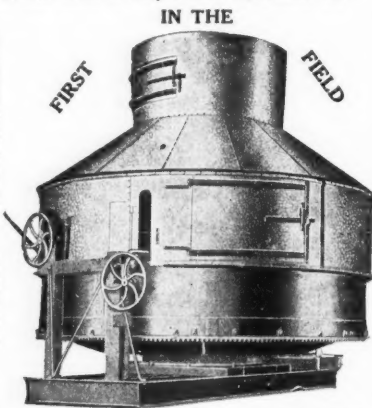
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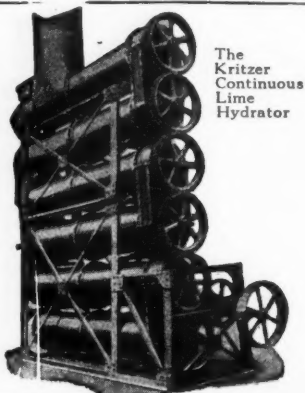
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Years ago we helped our customers create a demand for their hydrate. Today the demand exceeds the supply. That's why every lime manufacturer should have an efficient, economical hydrating plant.

THE KRITZER Continuous Lime Hydrator is efficient in production and economical in operation and maintenance. Let us investigate exhaustively the local conditions peculiar to your proposition, and then apply our experience of many years and design a plant to meet those conditions.

*A KRITZER plant, scientifically adapted to your conditions, will give you the best product at lowest cost*

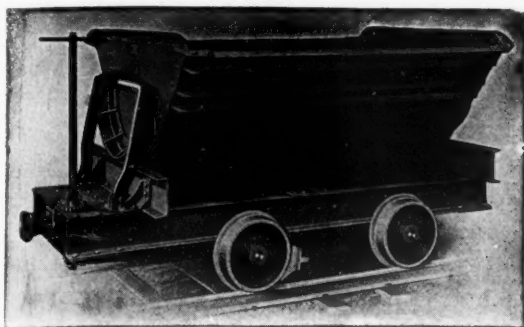
THE KRITZER COMPANY

503 South Jefferson Street

CHICAGO, ILL.

When writing advertisers please mention ROCK PRODUCTS





## More Than Reinforced

Reinforcing a dump car makes it stronger, of course. But there is a best way to reinforce. Atlas cars are reinforced the best way. Why? Simply because we have built dump cars so long and for so many people that we know just where the reinforcing should go and just how it should be done.

Not much wonder, then, that Atlas dump cars stand the "gaff" better than the average.

The Atlas Car & Manufacturing Co.  
ENGINEERS MANUFACTURERS  
CLEVELAND, OHIO, U. S. A.



## BATES WIRE TIES

have long since been universally accepted as the most secure, saving, and efficient means for closing bags of all sizes and descriptions.

OVER THREE HUNDRED MILLION BAGS were closed the Bates Way during 1921 in the Rock Products Industries alone.

A Free trial of Bates Wire Ties will convince you and will show you how we save time and money for our big family of satisfied customers.

### A Free Trial Outfit

consisting of one tying tool and liberal samples of wire ties suitable for your purposes will be gladly sent upon receipt of your agreement to try it on your work and within fifteen days send us \$3.50, the price of the tying tool, or return it to us. The sample wire ties cost you NOTHING.

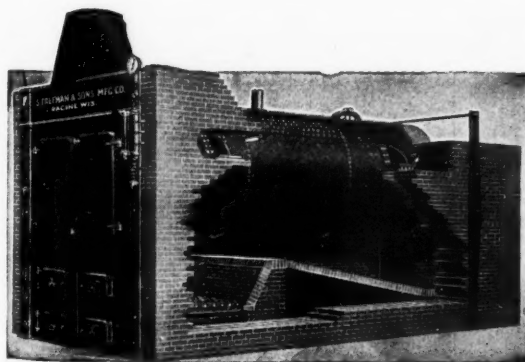
### BATES VALVE BAG COMPANY

7326 South Chicago Ave.  
Chicago, Ill.



110 Great Portland St.  
London, W. I., England

## FREEMAN Horizontal Return Tube High Pressure Boiler



Write for descriptive illustrated catalogue

Freeman Manufacturing Co.  
Main Office and Works, Racine, Wisconsin, U. S. A.



The Garner Brick Works, located at Haverstraw, New York, with this Minster Six-Ton are hauling their clay about a mile and are turning out 135,000 brick per 8-hour day. Consider this efficiency and adaptability and the economical advantages of the MINSTER over your present method and write for Catalog and information.

The Industrial Equipment Company  
310-316 Ohio Street, Minster, Ohio

Eastern and Export Department  
The Herbert Crapster Co., Inc., 1 Madison Ave., New York



## Perforated Steel Screens

The success of any house supplying repair and renewal parts depends on furnishing what is needed quickly and correctly, and of satisfactory quality.

Sixteen years in the Perforated Metal field have given us the experience, equipment and technical knowledge and three hundred tons or more of Steel Plates and Sheets enable us to fill rush orders promptly.

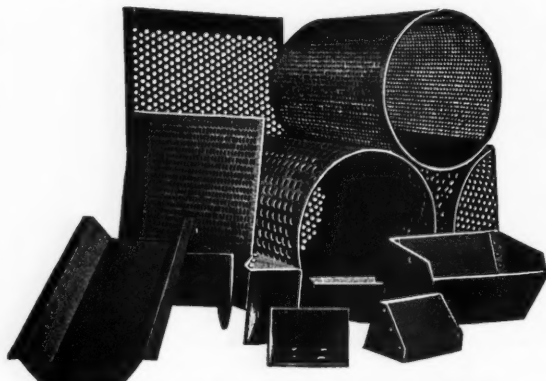
Try us with your next order.

Cross Engineering Company, Offices and Works, Carbondale, Pa.

## Perforated Metal Screens

FOR

Stone, Gravel, Sand, Etc.



### ELEVATOR BUCKETS

PLAIN AND PERFORATED

General Sheet and Light Structural Work

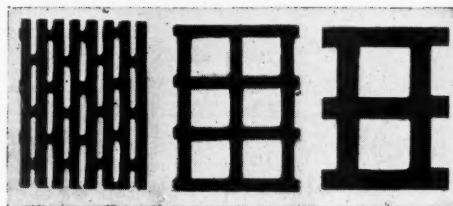
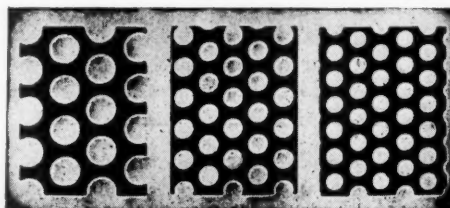
"Light and Heavy Steel Plate Construction"

**HENDRICK MFG. CO.**

CARBONDALE, PA.

New York Office, 30 Church Street  
Pittsburgh Office, 544 Union Arcade Bldg.  
Hazleton, Pennsylvania, Office, 705 Markle Bank Bldg.

## Perforated Steel Screens



For Screening Stone, Gravel, Sand  
and Cement

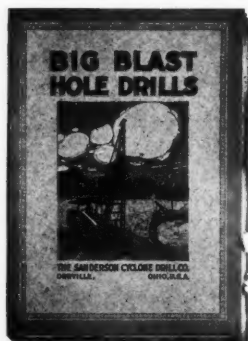
All sizes and shapes of holes in metal of proper thicknesses to give the best screening results.

Sheets furnished flat or rolled to shape for revolving screens.

**THE HARRINGTON & KING PERFORATING CO.**

621 N. Union Ave., Chicago, Ill.

NEW YORK OFFICE: 114 Liberty St.



## Analyze Your Drilling and Blasting

Our new Blast Hole Catalog B-46 (96 pages) will help you.

The day of poking a hole down with a rivet header or a converted hay bailer is past.

Drilling, being the first step in stone production, is the most important. One cent or one-half cent per ton cost saved in this operation often eliminates competition.

With Cyclone No. 14 Drills on the job and Cyclone Service in reserve, your drilling and blasting troubles fade—and your costs will be right.

**THE SANDERSON-CYCLONE DRILL CO.**

Orrville, Ohio

Eastern and Export Office, 30 Church St., New York



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# OSGOOD



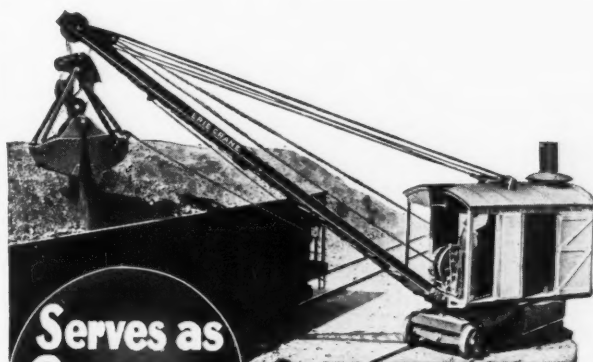
**BEST  
BY  
TEST  
"ASK THE USER"**

OSGOOD  $\frac{3}{4}$  and 1 cu. yd. Revolving Shovels are noted for their ability to produce more yards at less cost due to their rigid and sturdy construction, simplicity of operation and long life.

Every piece of the Traction or Continuous Mountings is of open-hearth, annealed cast steel. Quick Acting Power Steering Devices, Horizontal Hoisting Engines, Vertical Submerged Tube Type Boilers and the fact that Crane, Clamshell or Dragline features can be added now or later are IMPORTANT TO YOU.

Write for General Catalog 122-M.

**THE OSGOOD COMPANY**  
Marion, Ohio, U. S. A.



**Serves as  
Crane or  
Steam Shovel**

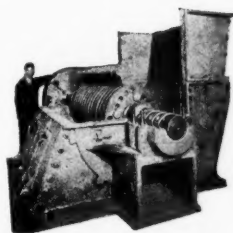
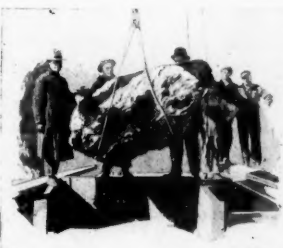
Every ERIE can be quickly and easily changed over to a Locomotive Crane. Gives excellent service with clamshell bucket — excavates gravel, loads cars, handles storage, etc.

In the hardest steam shovel service, gravel producers and quarrymen have found the ERIE very sturdy and reliable. "Our first ERIE has been digging hard gravel for 3 years without any repairs. We have in the past operated other steam shovels that are good, but the ERIE is the best, being by far the most substantial" — write the Standard Builders' Supply Co., Grand Rapids, Mich. They own 2 ERIES, a Steam Shovel, and a Crane.

We will be glad to send you a bulletin showing just what you can do with the ERIE, both as crane and steam shovel. Write for Bulletin P-16.

**ERIE STEAM SHOVEL CO., Erie, Pa., U. S. A.**  
Builders of Erie Steam Shovels and Locomotive Cranes

**ERIE** Revolving Shovels



## Why Operate 3 or 4 Crushers When One Will Do the Work?

The superiority of a crusher that will reduce 36" limestone to  $1\frac{1}{2}$ " in one reduction should be apparent to every quarry operator. Occupying a space 11 ft. x 16 ft. x 7 ft., the Williams Mammoth Crusher has many advantages over the elaborate system of crushers, elevators and conveyors heretofore necessary to obtain the same results. Initial investment is at least 50% lower. Crushing costs are reduced, while smaller housing requirements and elimination of connecting conveyors are additional advantages.

"The Mammoth Crusher is crushing 36" cube stone to  $1\frac{1}{2}$ " and finer with a minimum of fines, as we crush our stone for macadam purposes." — John Herzog & Sons, Forest, Ohio.

If you contemplate the installation of crushing or pulverizing equipment, or wish to reduce present costs, it will pay you to write the Williams Engineering Department.

**Williams Patent Crusher & Pulverizer Co.**  
800 St. Louis Avenue, St. Louis, Mo.

Chicago  
37 W. Van Buren

New York  
15 Park Row

San Francisco  
67 Second St.

### Williams Hinged Hammer Equipment Includes:

Mammoth crushers for reducing 36" cube limestone to  $1\frac{1}{2}$ ".

Jumbo crushers for crushing 18" stone to  $1\frac{1}{2}$ " or even agricultural size.

Pulverizers for reducing 3" stone to 95% 20 mesh.

Over 300 types and sizes for every reduction problem.



# Williams

**PATENT CRUSHERS GRINDERS SHREDDERS**

When writing advertisers please mention **ROCK PRODUCTS**





## "Our Experience Costs You Nothing"

The Greenville Mfg. Co. is the manufacturing and maintenance department of the Greenville Gravel Co., who operate a dozen large sand and gravel washing plants and have been in the business for 21 years.

The equipment manufactured by us is built to withstand the most severe wear and tear found only in handling gravel.

Our designs are the result of long experience in reducing costs, increasing output, and improving products.

Under no other conditions could such efficiency be obtained.

Let us figure on your requirements and share with you the results of our experience. Write for our catalog.

### WE MANUFACTURE

Bin Gates  
Automatic Feeders  
All types of Screens  
Transmission Machinery  
Complete Belt Conveyors  
Complete Bucket Elevators  
Automatic Sand Settling Tanks

## The Greenville Mfg. Co.

"Specialists in Sand and Gravel Plant Equipment"  
GREENVILLE, OHIO

## MAKE YOUR STEEL BARRELS



We earnestly advise every lime manufacturer to operate a steel barrel department on the basis of economy and ultimate satisfaction.

There is no question about the steel barrel made by Stoll machinery. They are made atmospheric proof without welding, and they are strong, serviceable containers, delivering your product to the consumer in a condition that assures satisfaction, a pleased customer, and continued business relations.

We will be pleased to give you complete information—figures and data—on the economy and desirability of this method of shipping your product.

## D. H. STOLL COMPANY, INC.

Buffalo, N. Y.

# LET NEFF & FRY DO IT

Let us build your storage bins. We build them for every need and every purpose, build them of concrete staves, puddled or power tamped, 2½ or 3½ in. thick, concrete blocks 8 in. or monolithic with 6-in. wall.



Six Neff & Fry Bins at Keystone Gravel Co., Dayton, Ohio

We will assume all of the responsibility, will do all the erecting and give an ironclad guarantee.

We will modernize your methods, beautify your yard, increase your business and save you money.

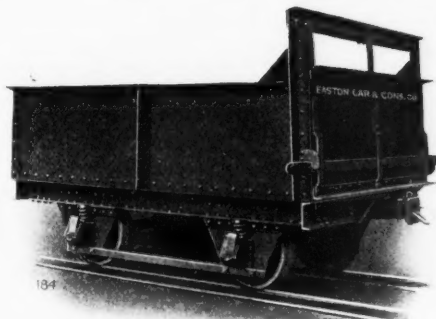
Write for catalog, or better still, let us know your needs, and we will advise you, without obligation the size and type of bins best suited to your requirements.

Three factories located at Kalamazoo, Mich., Peoria, Ill., Camden, Ohio, insure low freight rates

NEFF & FRY, Camden, Ohio

Eastern Office—736 Drexel Building, Philadelphia, Pa.  
General Office—Camden, Ohio

# EASTON *End Dump* CARS

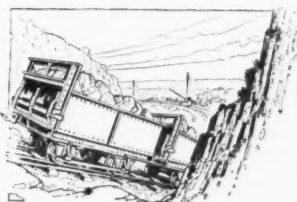


## With AUTOMATIC DOOR

Dumps automatically from inclined track when the door is tripped by block alongside track. Eliminates the use of tipple. Rugged construction. Positive action. Long life. Built in various sizes and track gauges for hand or steam shovel loading. Details on request.



Appearing in these advertisements from time to time are brief illustrated descriptions of certain of the complete line of standard types of Easton Quarry Cars. You are invited to write us regarding exact requirements.



"Quarry Car Practice," a 32-page Bulletin covering an investigation of quarry work under many conditions, gladly sent to any interested quarry man.

28 HOLLEY ST., EASTON, PA.

New York Philadelphia Pittsburgh  
St. Louis Norfolk Savannah  
Birmingham Salt Lake City Los Angeles

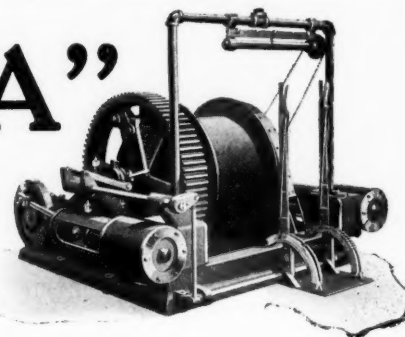
# EASTON CAR & CONST'N CO.



2164-E

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# "OTTUMWA" HOISTS



The illustration represents our latest improved Double Cylinder Single Independent Band Friction Clutch Drum Hoisting Engine with the clutch mechanism carried by the main geared wheel.

The engines are made to gauge and every engine is tested with steam or air before shipping.

We make hoists of every description and to meet every need and we maintain a corps of competent and experienced engineers with whom you are invited to consult.

They can aid you in solving any hoisting problem and in properly applying machinery for the best results.

**Ottumwa Iron Works, Ottumwa, Ia., U. S. A.**

## *Free Service to Readers of* **Rock Products**

If you are in the market for any kind of machinery, equipment or supplies, or if you desire catalogs, information or prices on any product, we are at your service—to obtain for you, without expense, catalogs, prices or specific information on every kind of machinery, equipment and supplies—or to help you find the hard to find source of supply.

### **RESEARCH SERVICE DEPARTMENT**

**ROCK PRODUCTS, 542 So. Dearborn St., Chicago, Illinois**

Please send me catalogs and prices concerning the following items:

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 Name.....  
 Address.....  
 City..... State.....

*When writing advertisers please mention ROCK PRODUCTS*



# PLAMONDON TRANSMISSION MACHINERY

## Dust Proof Friction Clutches—

The continuous friction surfaces of the Plamondon Disc Type Friction Clutch, consists of but three parts, with all the simple mechanism for adjusting and operating on the outside in plain view.

No part is affected by centrifugal action—they can be run at high speed with safety, and without loss of efficiency. The adjustment for wear is made entirely by means of one adjusting collar, which gives a uniform pressure on all parts of the friction surfaces. These surfaces are absolutely dust proof, and are universally used by leading cement mills.

Our products also consist of Heavy Gearing, Cut Gears and Machine Molded Gears of all kinds—Shafting, Pulleys, Hangers, Couplings, Collars, Pillow Blocks, Worm-Wheels, Fly-Wheels, Rope Sheaves, Grey Iron and Semisteel Castings by analysis.

We Solicit Inquiries

## A. PLAMONDON MANUFACTURING CO.

Engineers, Founders, and Machinists

Established 1859 — Incorporated 1877

Works and Main Office: 5301 South Western Boulevard, Chicago, Illinois

EMERGENCY ORDERS RECEIVE SPECIAL ATTENTION

## “A WILLING WORKER”

It is sometimes difficult to get the first olive out of the bottle, but after you get the first one the rest comes easy.

It's the same in selling Type “J” Locomotive Cranes. Sell one Type “J” and repeat orders follow.

### WHY?

Because it is a regular “honest to goodness” crane, big by comparison, both in size and service.

It is human nature to like a willing worker, one that does a full day's work, day after day, without interruption or without coaxing.

Try out the type “J” and its operation will speak more convincingly than anything that can be said of its merits.

**The McMyler Interstate Company**  
Cleveland, Ohio LC-108

#### BRANCH OFFICES:

New York City.....	1756 Hudson Terminal Building
Chicago, Illinois.....	812 Edison Building
Seattle, Washington.....	Hoge Building
Denver, Colorado.....	18th and Wazee Streets
San Francisco, California.....	766 Folsom Street
New Orleans, Louisiana.....	444 Maison Blanche Annex
Birmingham, Alabama.....	Brown-Marx Building
Boston, Massachusetts.....	261 Franklin Street



When writing advertisers please mention ROCK PRODUCTS



# MAXECON

## Preliminary Grinder for Tube Mills

LIMESTONE ..... 20 to 40 Mesh  
CEMENT CLINKER ..... 20 to 60 Mesh

## MAXECON MILL PERFECTECON SEPARATOR

The UNIT that has LARGER  
OUTPUT with LESS POWER  
WEAR and ATTENTION than  
any other.

It will be to the interest of those who operate CEMENT  
PLANTS to know what the Maxecon Unit will do.

Drop us a line

We will be glad to tell you about it

**Kent Mill Company**  
10 Rapelyea Street  
BROOKLYN, N. Y.



## Here is the Solution to Your Fine Grinding Problem

Many of the leading concerns have found the solution  
to their fine grinding problems on Gypsum, Cement, Talc  
and Soapstone, Graphite, Limestone and similar materials  
by installing

## MUNSON Under Runner Buhr Mills

There is practically no limit to the degree of fineness to which these  
mills will grind these products. They will do the work economically  
and satisfactorily in every way. Solid in construction—will do away  
with delays and shut-down and keep out of the repair shop. Their  
Automatic Adjustment, Rapid Grinding and Perfect Balance In-  
sure good results and fine and uniform grinding.

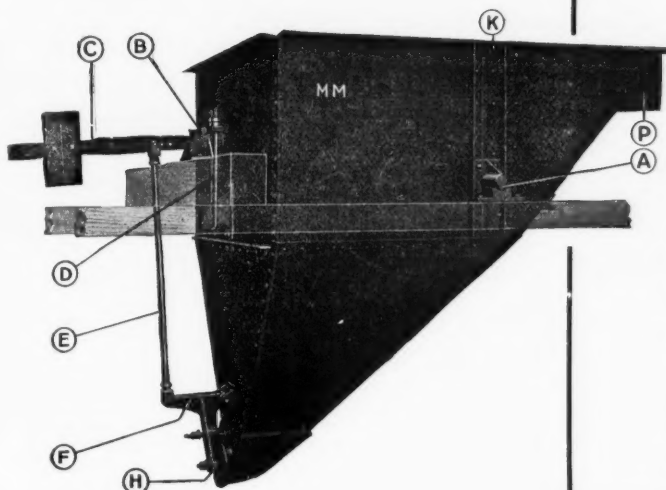
Why not investigate? Send  
for our new catalog, number 71

**MUNSON**  
Mill Machy. Co., Inc.  
Utica, New York



*When writing advertisers please mention ROCK PRODUCTS*

# Only 5% Free Water in Telsmith Sand



The Telsmith Sand Tank and its counterweight-arm are both carried on knife-edge bearings, with a wide range of adjustment. As the tank pivots one way, the valve plate pivots in the **OPPOSITE DIRECTION**, giving ample discharge area with a short, snappy valve action. The swing of both members is limited by an adjustable stop, so that the sand is discharged in **SMALL QUANTITIES** but at **FREQUENT INTERVALS**, assuring a deep sand-bed and a dry product. ***Absolutely Automatic action guaranteed.***

Get this! Careful tests under operating conditions show that Telsmith sand contains under 5 per cent free water and a total moisture content under 25 per cent. No other tank de-waters so thoroughly.

**SMITH ENGINEERING WORKS** 3188 LOCUST ST.  
MILWAUKEE, WISCONSIN

***Always  
on the  
Job!***

In power, but not in size, this is a whale of a machine. It will take care of your needs, as your development work advances, as well as it will do it today. It is always on the job, performing the work for which it was designed, tackling the haulage problem in quarries efficiently and economically, securing greater production at lower costs.

This machine is made in sizes from 4 to 7 tons, for gauges ranging from 24 to 56½ inches, and has a draw bar pull of 1600 pounds.

Specifications and prices on request

**The Hadfield-Penfield Steel Co., Bucyrus, Ohio**





# Buyers' Directory of the Rock Products Industry

Classified Directory of Advertisers in Rock Products

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## AIR COMPRESSORS

Bury Compressor Co., Erie, Pa.  
Ingersoll-Rand Co., New York City.

## AUTOMATIC WEIGHERS

Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

## BAGS AND BAG MACHINERY

Bates Valve Bag Co., Chicago, Ill.  
Jaite Co., The, Jaite, Ohio.  
Valve Bag Co. of America, Toledo, Ohio.

## BARREL MAKING MACHINERY

The D. N. Stoll Co., Buffalo, N. Y.

## BELTING

Greenville Mfg. Co., Greenville, Ohio.  
New York Belting & Packing Co., New York, N. Y.

## BINS

Neff and Fry, Camden, Ohio.  
Weller Mfg. Co., Chicago, Ill. (storage)

## BIN GATES

Allis-Chalmers Mfg. Co., Milwaukee, Wis.  
Bacon, Earle C., Inc., New York City.  
Greenville Mfg. Co., Greenville, Ohio.  
Link-Belt Co., Chicago, Ill.  
Sturtevant Mill Co., Boston, Mass.  
Traylor Eng. & Mfg. Co., Allentown, Pa.  
Weller Mfg. Co., Chicago, Ill.

## BLASTING SUPPLIES

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Hercules Powder Co., Wilmington, Del.

## BOILERS, WASTE, HEAT

Edge Moor Iron Co., Edge Moor, Del.  
Freeman Mfg. Co., Racine, Wis.

## BRICK MACHINERY

Besser Sales Co., Chicago, Ill.

## BUCKETS—Elevator

Austin Mfg. Co., Chicago, Ill.  
Greenville Mfg. Co., Greenville, Ohio.  
Hendrick Mfg. Co., Carbondale, Pa.  
Weller Mfg. Co., Chicago, Ill.

## BUCKETS

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Orton & Steinbrenner, Chicago, Ill.

## CABLEWAYS

S. Flory Mfg. Co., Bangor, Pa.  
Interstate Equip. Co., New York, N. Y.

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## CARS—Quarry and Industrial

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Ottumwa Iron Works, Ottumwa, Iowa.  
Watt Mining Car Wheel Co., Barnesville, Ohio.

## CAR PULLERS

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Kennedy-Van Saun Mfg. & Eng. Corp., New York City.

## CONVEYORS AND ELEVATORS

Caldwell, H. W. & Son Co., Chicago, Ill.  
Link-Belt Co., Chicago, Ill.  
Smith Eng. Works, Milwaukee, Wis.  
Robins Conveying Belt Co., New York City.  
Sturtevant Mill Co., Boston, Mass.  
Universal Road Mach. Co., Kingston, N. Y.  
Greenville Mfg. Co., Greenville, Ohio.

## CRANES—Locomotive, Gantry

Byers Mach. Co., The, Ravenna, Ohio.  
Erie Steam Shovel Co., Erie, Pa.  
McMyler-Interstate Co., Cleveland, Ohio.  
Ohio Locomotive Crane Co., Bucyrus, Ohio.  
Orton & Steinbrenner, Chicago, Ill.  
Osgood Co., The, Marion, Ohio.

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Austin Mfg. Co., Chicago, Ill.  
American Pulverizer Co., St. Louis, Mo.  
Bacon, Earle C., Inc., New York, N. Y.  
Buchanan Co., Inc., C. G., New York, N. Y.  
K. B. Pulverizer Co., New York, N. Y.  
Lewistown Fdry. & Mach. Co., Lewistown, Pa.  
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.  
Pennsylvania Crusher Co., Philadelphia, Pa.  
Raymond Bros. Impact Pulv. Co., Chicago, Ill.  
Smith Eng. Works, Milwaukee, Wis.  
Sturtevant Mill Co., Boston, Mass.  
Traylor Eng. & Mfg. Co., Allentown, Pa.  
Universal Crusher Co., Cedar Rapids, Iowa.  
Universal Road Mach. Co., Kingston, N. Y.  
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

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## DIPPER TEETH

American Manganese Steel Co., Chicago Heights, Ill.

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Sanderson Cyclone Drill Co., Orrville, Ohio.

## DRILLERS

Pennsylvania Drilling Co., Pittsburgh, Pa.

## DRYERS

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Kennedy-Van Saun Mfg. & Eng. Corp., New York City.  
Vulcan Iron Works, Wilkes-Barre, Pa.  
Weller Mfg. Co., Chicago, Ill.

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## DYNAMITE

E. I. du Pont de Nemours & Co., Wilmington, Del.  
Hercules Powder Co., Wilmington, Del.

## ENGINES—Steam

Morris Mach. Works, Baldwinsville, N. Y.

## ENGINES—Oil

Kahlenberg Bros. Co., Two Rivers, Wis.

## ENGINEERS

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Crow, Waller, Inc., Chicago, Ill.  
Ehram & Sons Co., J. B., Enterprise, Kans.  
R. W. Hunt & Co., Chicago, Ill.  
Smidth & Co., F. L., New York, N. Y.  
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.

## EXCAVATORS

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Erie Steam Shovel Co., Erie, Pa.  
Marion Steam Shovel Co., Marion, Ohio.  
Northwest Eng. Co., Green Bay, Wis.

## EXCAVATORS—Dragline Cableway

Link-Belt Co., Chicago, Ill.  
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## EXPLOSIVES

E. I. du Pont de Nemours & Co., Wilmington, Del.  
Hercules Powder Co., Wilmington, Del.

## FUSES

Ensign-Bickford Co., Simsbury, Conn.

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## GEARS

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Plamondon Mfg. Co., Chicago, Ill.

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Burke Electric Co., Erie, Pa.

**AMSCO**

# Clark Reversible Teeth



Clark Reversible Tooth (Patented)

They meet the most severe digging conditions, such as are encountered by large revolving shovels, working in quarries or stripping the overburden of coal, ore, etc. The points are quickly reversed or changed by moving one bolt.

Note the tapered bolt to hold the point tight and the lugs on the side of the base to keep it from spreading—two of several features in the design that enable this product to withstand severe quarry conditions.

## AMERICAN MANGANESE STEEL COMPANY

General Sales Offices, 398 E. 14th St., Chicago Heights, Ill.

Plants:

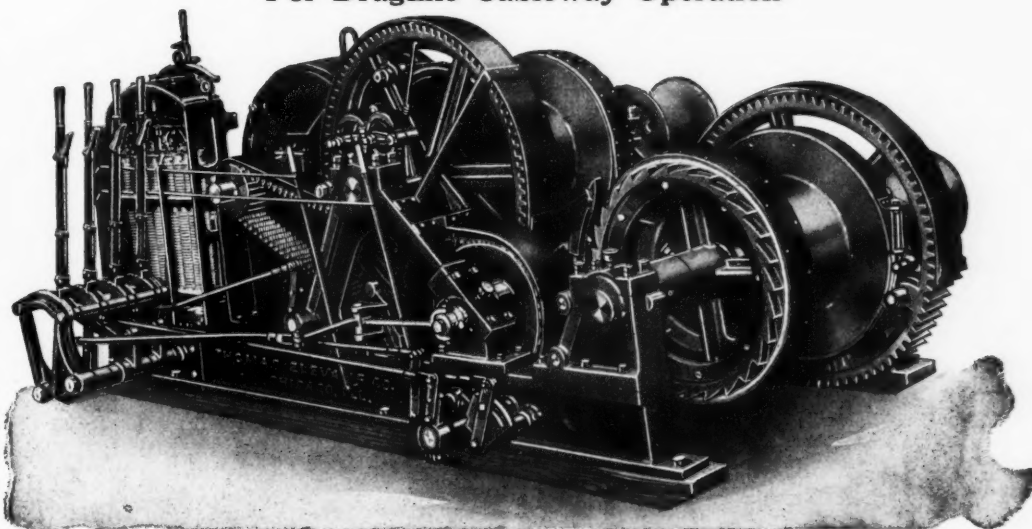
Chicago Heights, Ill.

New Castle, Delaware

Oakland, California

# THOMAS TWO SPEED HOISTS

For Dragline Cableway Operation



## THOMAS ELEVATOR COMPANY

27 South Hoyne Avenue

Chicago, Ill.

When writing advertisers please mention ROCK PRODUCTS

# Buyers' Directory of the Rock Products Industry

Classified Directory of Advertisers in Rock Products

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Lewistown Fdy. & Mach. Co., Lewistown, Pa.

## GRATES

The Kramer Bros. Fdy. Co., Dayton, Ohio.

## HOISTS

Flory Mfg. Co., S., Bangor, Pa.  
J. S. Mundy Hoisting Engine Co., Newark, N. J.  
Ottumwa Iron Works, Ottumwa, Iowa.  
Thomas Elevator Co., Chicago, Ill.  
Vulcan Iron Works, Wilkes-Barre, Pa.  
Weller Mfg. Co., Chicago, Ill.

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Glamorgan Pipe & Fdy. Co., Lynchburg, Va.  
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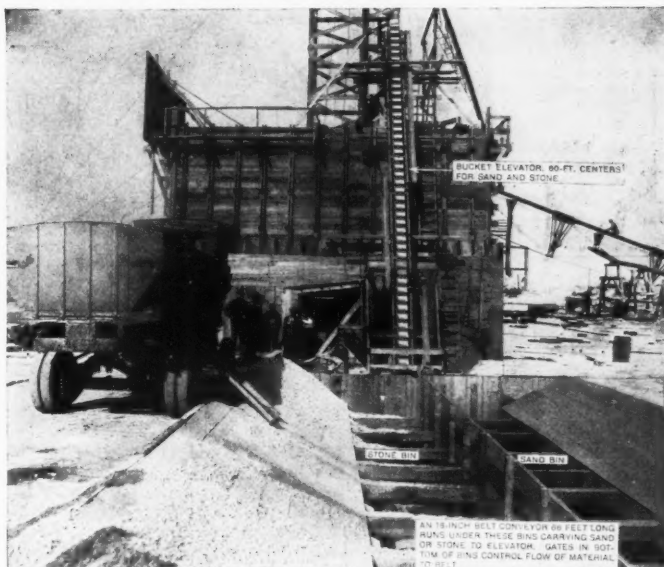
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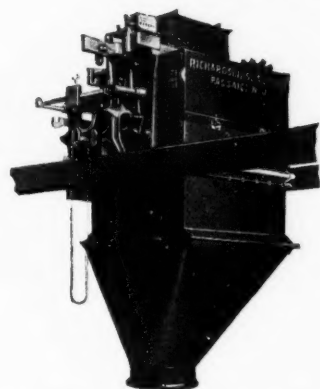
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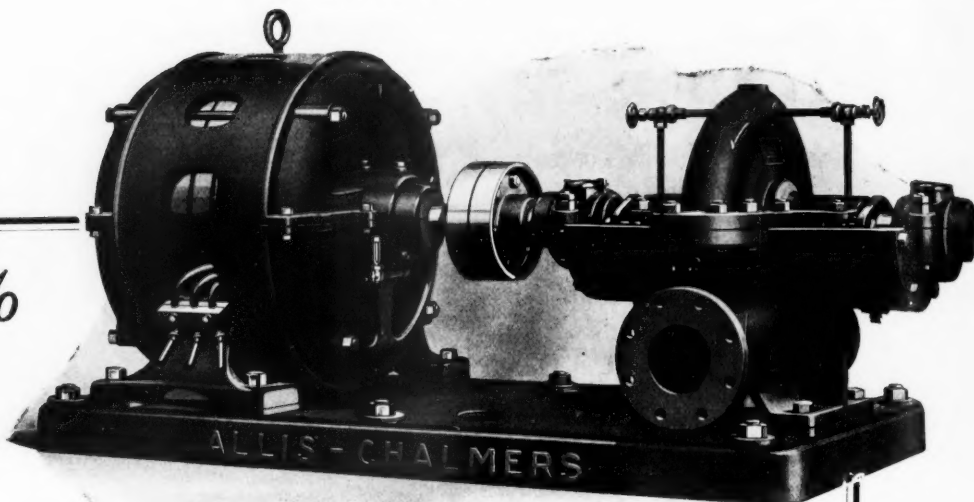
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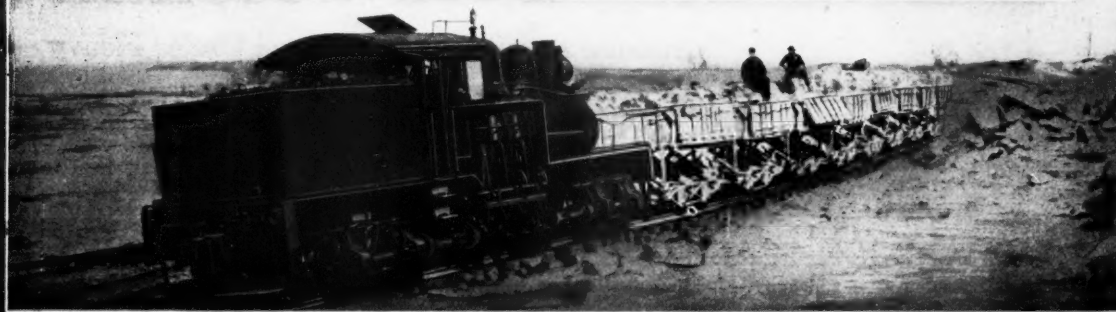
The Shay has greater pulling power. It *stays* on track that is too rough and curves that are too sharp for a rod engine.

Write for details.

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Lima, Ohio

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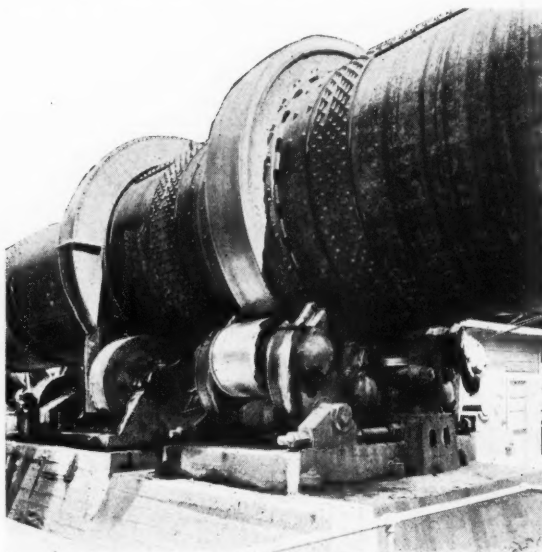
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## Here's an Underneath View



This illustration shows the sturdy construction of Vulcan Rotary Kilns.

The installation is the Western States Portland Cement Company, Independence, Kansas. They operate four 9'0"x175'0" two-tire Vulcan Rotary Kilns.

The tire and roller bearing supports under the tire, together with thrust roller bearings are seen in the illustration. In front of the tire is the Girth gear with driving gear train. These are encased in steel plate gear-guards.

We will be pleased to go into further details of Vulcan Rotary Kiln construction; also to have our engineers work with you in your individual problems relating to kilns.

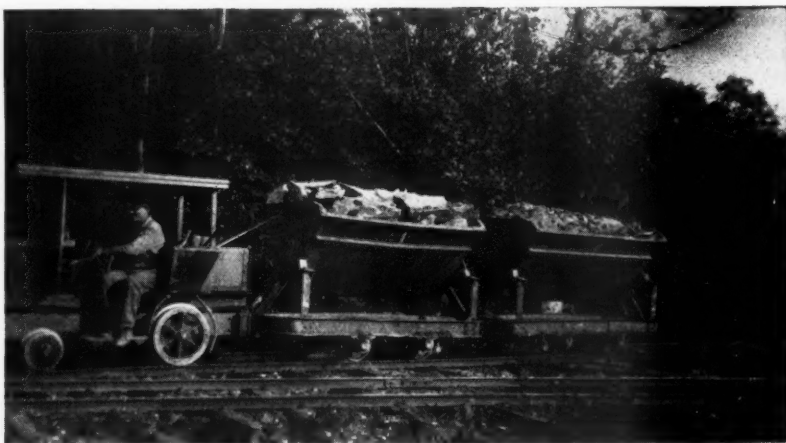
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**Established 1849**

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## Saving 45%

The Blue Ridge Talc Co., Inc., of Henry, Va., have reduced their haulage costs about 45% under 6 ton standard make gasoline locomotive formerly used, by installing locomotive with Ford ton truck power unit, attachments manufactured and complete locomotive assembled by the Brookville Truck & Tractor Co., Brookville, Pa. Attachments including the patented Brookville auxiliary reverse transmission, giving locomotive the Ford ton truck high and low speeds as well as the same pulling power when running ahead or in reverse.

Gas consumption alone in comparison with the 6 ton machine has been reduced from 13 gallons to 4½ gallons, for identically the same work. This is a saving worthy of your consideration and a few extracts from Mr. Kitson's letter, printed below, tells an interesting and valuable story.

Gentlemen: We are inclosing a small photo of a couple of loaded soapstone cars, with the FORD one-ton truck power unit converted into a locomotive for haulage on our tracks.

Cost of delivering mine run soapstone from quarry to mill has been reduced about 45% with the use of this converted equipment. This will operate nine hours on about four and one-half gallons of gasoline. Any operator familiar with driving a FORD can operate it. Few of us who don't learn how to drive a FORD.

This machine handles two loaded cars of five tons net weight, and each car weighs about 1200 lbs. The haul is down a grade averaging 3¼% with several short sections of 5%, and delivers two loads up 5½ grade of 300 feet. This is all done on high. Loads are dumped into crusher, hopper or into air drying sheds. The material after being crushed is pulverized in any mesh from 100 to 350.

Yours truly,

BLUE RIDGE TALC CO., INC.  
C. O. Kitson, Sec'y and Treas.

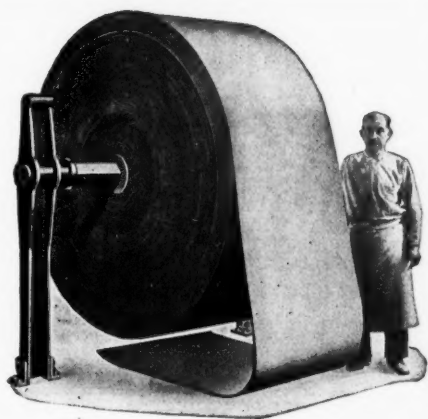
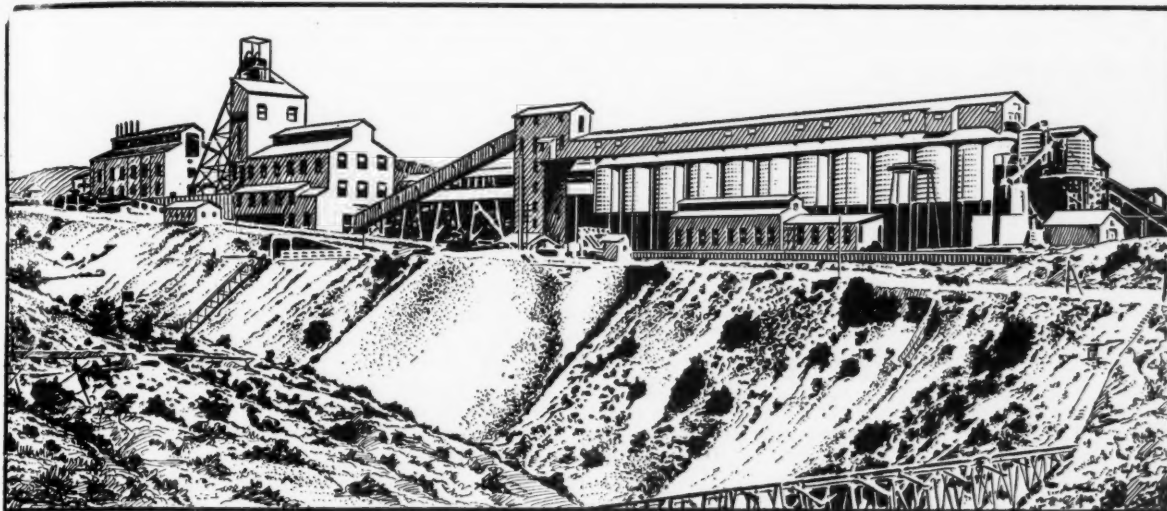
There is the convincing evidence of the efficiency of this machine. It tells all there is to tell about the economy and the ability of the Brookville to deliver the goods. Do you want more evidence? We are able to furnish it

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The belt cost for conveying this huge quantity of ore is 66/1000 of a cent per ton, truly a remarkable figure for any service.

Width of belt, 30 inches.

Number of plies, 6.

Thickness of cover: Conveyor side,  $\frac{1}{4}$  inch.

Pulley side,  $\frac{1}{32}$  inch.

Date installed, March 11, 1911.

Date taken off, June 1, 1918.

This belt was installed in two sections. The inclined belt, operating at an angle of  $3\frac{1}{2}$  inches in 12 inches is 530 feet in length, and the horizontal belt which distributes ore to the bins is 680 feet long.

This installation is an example of a conveyor belt designed by our belt men after careful investigation of all the operating conditions.

These facts determine the character of the rubber compounds

used, the kind and weight of duck, and the correct number of plies.

The result is a belt of wear-defying construction that comes through the test of heavy work with cost figures well on the credit side.

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